Professional ethics

Ethics as a computing professional

What are ethics?

- Ethics are a set of principles that help us decide what is **right or wrong**

- They guide **how we behave and make decisions**, especially in situations where there isn't a clear answer

- In computing, an **ethical issue** is when technology creates a situation that challenges a person's **morals and values**

- These issues can be difficult because:

  - Technology moves fast, but **laws take time to catch up**

  - There may be **no single "correct" answer**

  - Choices can have **serious consequences** for both individuals and society

Computer ethics

- Computer ethics are a set of **principles that guide how computers and technology should be used responsibly and fairly**

- They help **prevent misuse** and **protect people's rights** in a digital world

- The three key areas of computer ethics are:

  - **Intellectual property rights**

    - It is **unethical to copy or use software, music, or digital content** without permission from the owner

    - Example: Downloading and using paid software without a licence

  - **Privacy**

    - Users have the right to keep their **personal information safe**

    - It is **unethical (and illegal)** to access someone's personal data without their permission (e.g. **hacking**)

  - **Impact on society**

    - Computers affect **how we work and live**

    - Ethical concerns include **job losses due to automation**, **social media effects**, and **digital addiction**

- The internet has made **plagiarism** easier, this is when someone **copies another person's work and claims it as their own**

- It's **not wrong to use someone's idea**, but you **must give credit**

- This is done through:
  - **Footnotes**
  - **References or citations** at the end of a document
- **Anti-plagiarism software** exists to scan and detect copied content from websites

Ethical bodies

What is an ethical body?

- An ethical body is an organisation that publishes a **code of conduct** which its members are expected to follow
- Being a member of an ethical body shows a commitment to **professional integrity** and maintaining **high ethical standards** in your work
- Examples of ethical bodies include:
  - **British Computer Society (BCS)**
  - **Institute of Electrical and Electronics Engineers (IEEE)**

British Computer Society (BCS)

- The **professional body for IT and computing** in the UK
- Promotes **ethical behaviour**, **good practice**, and **high standards** in tech-related jobs
- Members follow a **Code of Conduct** to ensure responsible use of technology

Institute of Electrical and Electronics Engineers (IEEE)

- A global organisation for **engineers, developers, and computer scientists**
- Sets **technical standards** and encourages **ethical and professional behaviour** in tech fields
- Known for publishing **research** and **codes of ethics**

Benefits of being a member of an ethical body

Benefit	Explanation
Clear ethical guidelines	Members follow a written code, so they don't have to decide what is ethical on their own
Trusted by clients and colleagues	Clients and staff know the member is working to recognised standards
Professional reputation	Being part of an ethical body shows you are reputable and serious about your work

Recognised skills and knowledge	Entry may require qualifications or passing a test, showing you meet high standards
Help and support	Members can get advice (e.g. legal help) when needed
Training and development	Access to training courses helps members keep their skills up to date

Ethical conduct

Example 1: Software development team

- A **project manager** leading a team of developers should:
    - **Treat all team members fairly**, listen to their ideas, and avoid favouritism
        - This helps team members feel **valued**.
    - **Respect work–life balance** by avoiding unrealistic deadlines
        - This supports better **teamwork** and helps get the **best work** out of them
    - Encourage **collaboration** and clear communication to avoid conflict
        - A team that works well together creates a **better product** for the client

Example 2: IT support company owner

- An **IT company owner** managing technicians who visit clients should:
    - Provide **fair pay** and ongoing **training** to keep staff skilled and motivated
        - Staff feel **valued**, which improves performance
    - Promote **ethical behaviour** with clients (e.g. don't overcharge or mislead)
        - Builds **trust** within the team and with clients, leading to **better service**
    - Create a culture of **respect and teamwork**, even under pressure
        - Helps staff support each other and deliver a **high–quality solution** to clients

Worked Example

Aisha manages a team of software developers.

Explain the reasons why it is important that Aisha acts ethically in relation to her team members. **[2]**

Answer
- To make sure the team members feel valued [1 mark]
- To get the best work out of the team [1 mark]
- To enable them to work well together [1 mark]
- To enable them to create the best product for the client [1 mark]

Legal frameworks

Copyright

What is the Copyright Designs & Patents Act?

- This protects the **intellectual property** of an individual or a company

- It makes it **illegal** to copy, modify or distribute software or other intellectual property without the relevant **permission**

- If **original work** is original, copyright will be **automatically applied** and will not expire until 25 - 70 years from the death of the creator depending on the type of work

- If an individual believes that their work has been copied it is their responsibility to take action under the **Copyright Designs and Patents Act**

- Many sites online offer free downloads of copyrighted **software/videos** which prevents the intellectual copyright holder from earning their income on the work they have created

   - E.g. If someone downloaded videos from Netflix and shared them with others, they would be breaching the act

- The act covers videos and audio where **peer-to-peer streaming** prevents a copyright owner from receiving an income

What is Prohibited Under the Copyright, Designs & Patents Act?

Primary breaches:

- **Copying** an original work

- **Issuing** the copy of the original work to the public

- **Renting/lending** the copy of the original work to the public

- **Performing**, **showing** or **playing** the original work in public

- **Making** an adaptation of the original work

Secondary breaches:

- **Importing** a copy of original work

- **Possessing** or dealing with a copy of the original work

- **Providing** means to make copies of the original work

- **Permitting** the use of premises for making copies of the original work

- **Provision** of props/equipment for a performance of a copy of the original work

Case Study

Ed Sheeran Vs Marvin Gaye (External link to bbc.co.uk)

- A case was brought against Ed Sheeran about his song 'Thinking Out Loud'
- Ed Sheeran won his case which ruled that he did not copy 'Let's Get It On' by Marvin Gaye whilst composing 'Thinking Out Loud'
- The heirs of Gaye's co-writer argued that Sheeran owed them money for infringement of copyright
- Sheeran said that if he was found guilty he would give up his music career
- The songs were said to have a similar chord progression but it was argued that these are the base of all modern songs and should be free to use
- Sheeran won a high court battle in London in 2022 over the copyright of his 2017 song 'Shape of You'
- In 2015 Gaye's heirs won a $5.3m judgement from a lawsuit claiming that Robin Thicke's 'Blurred Lines' copied Gaye's 'Got to Give it Up'

Examiner Tips and Tricks

- Make sure that you specify that the Copyright Design and Patents Act covers original work and is automatically applied from the creation of the work, then talk about what this means for the distribution of the work. For example:

    - *The work was protected by the Copyright Designs and Patents act when it was created. Therefore if anyone wishes to distribute it they have to gain the owner's permission, if they just posted it to the internet then this would be in breach of the act.*

- Also when referring to the name of the act, ensure you use its full name (The Copyright, Designs and Patents Act). It's not called the Copyright Act. If you use a shortened version it may cost you marks in the exam

Software licensing

Commercial

- Users must **pay** for the software

- The developer earns an **income** from each purchase

- The software is **copyrighted**, so:

    - Users **cannot legally edit, copy, or resell** the program

    - The developer **retains full control** over the product

- Legal action can be taken against **piracy or illegal distribution**

Shareware

- Software is **free to try**, often with time or feature limitations

- Users must **pay** to unlock the **full version**

- The software is **copyrighted**, so:

  - Users **cannot edit or redistribute** the program legally

  - The developer **retains control**

- This model encourages users to try before buying, increasing the chance of a sale

Freeware

- Software is **free to use and download**

- It is still **copyrighted**:

  - Users **cannot legally edit, copy, or sell** the software

  - The developer **keeps ownership and control**

- Although free, users must still follow the licence conditions

Open Source Initiative (OSI)

- The Open Source Initiative promotes software that is **freely available and open to everyone**

- **Open source software** comes with a licence that:

  - Allows users to **view, edit, and share** the source code

  - Encourages **collaboration and improvement** by the community

- Open source does **not always mean free**, some open-source software is paid, but users can still see and change the code

- Developers must still **credit the original authors** when modifying or sharing the software

- Example: **Linux**, **Firefox**, **Apache Web Server**

Free Software Foundation (FSF)

- The Free Software Foundation promotes **freedom**, not just free price

- It supports software that gives users four essential freedoms:

  1. **Freedom to run** the program for any purpose

  2. **Freedom to study** how the program works, and change it

  3. **Freedom to redistribute** copies

  4. **Freedom to improve** the program and share improvements

- This type of software is often referred to as **free software** or **libre software**, and it usually provides access to the **source code**

- The FSF supports **user rights**, **transparency**, and **collaboration**

- Example: **GNU/Linux**, **LibreOffice**, **GIMP**

Feature	Commercial	Shareware	Freeware	Open Source (OSI)	Free Software (FSF)
Cost to use	Must be paid for	Free trial, then pay for full version	Free to use	Often free, but not always	Always free to use
Access to source code	No	No	No	Yes	Yes
Can be edited or modified	No – protected by copyright	No – protected by copyright	No – cannot edit or change	Yes – with conditions under OSI licences	Yes – full freedom to modify
Redistribution allowed	No	No	No	Yes (under licence terms)	Yes (freedom to share and improve)
Copyrighted	Yes	Yes	Yes	Yes	Yes
Developer control	Developer retains full control	Developer retains control	Developer retains control	Shared control between developers and users	Users have full control
Focus	Developer income and protection	Try before you buy	Free use only	Collaboration and transparency	Software freedom and user rights

Worked Example

A game will be released under a licence.

Tick one or more boxes in each row to identify the licence(s) each statement describes.**[4]**

Statement	Free Software Foundation	Open Source Initiative	Shareware	Commercial Software
The user can edit the source code				
The user must always pay before being able to use the software				
The user can redistribute the software				
The user always gets a trial period				

Answer

1 mark for each correct column

Statement	Free Software Foundation	Open Source Initiative	Shareware	Commercial Software
The user can edit the source code	✓	✓		
The user must always pay before being able to use the software				✓
The user can redistribute the software	✓	✓		
The user always gets a trial period			✓	

Artificial intelligence (AI)

Understanding AI

What is artificial intelligence?

- Artificial intelligence (**AI**) is a machine that can **simulate intelligent behaviours** similar to that of a **human**

- AI is a system that can:

  - **Learn** - acquire new information

  - **Decide** - analyse and make choices

  - **Act autonomously** - take actions without human input

- There are two main types of AI:

  - **Weak AI**, also known as **narrow AI**, is designed to perform a specific task or set of tasks

  - **Strong AI**, also known as artificial general intelligence (**AGI**), is designed to perform any intellectual task that a human can do

Advantages and disadvantages of AI

Advantages	Disadvantages
Increased efficiency	Job losses
Increased accuracy	Potential for biased decision making
Scalability	Ethical concerns over its use

Characteristics of AI

- AI shares **three** common characteristics:

  - **Collection of data**

  - **Rules for using data**

  - **Ability to reason**

Collection of data	Rules for using data	Ability to reason
AI systems require **large amounts of data** to perform tasks The data is processed using **rules or algorithms** that enable the system to make decisions and predictions	AI systems can use **logical reasoning** to evaluate information and **make decisions** based on that information	It can **change its own rules** and **data**

Impact of AI

Social

Workforce

- AI adoption is expected to significantly **change employment structures**:

  - **Automation** may replace some roles, leading to **unemployment** or **job role changes**

  - At the same time, **new jobs will emerge** that require AI knowledge or human–AI collaboration

  - To support this shift, **reskilling and upskilling programmes** are essential, ensuring the workforce is prepared for AI-driven transformations

Education & Accessibility

- The rise of AI introduces concerns around **equal access**:

  - Those with better **technology, education, and internet access** may benefit more from AI, creating a **digital divide**

  - To prevent **social disparities**, it is important to ensure **equal access to AI education, tools, and training** for all communities

Healthcare

- AI has the potential to transform healthcare, but raises important **ethical and safety concerns**:

  - AI can improve **diagnosis, treatment planning**, and **patient monitoring**

  - However, AI systems are **not infallible** – a wrong diagnosis or treatment recommendation can have **serious consequences**

  - It is vital to determine the **extent of human oversight**

  - Decisions made **solely by AI** in critical situations can be risky

  - The question of **who is responsible** when something goes wrong (the developer, the AI system, or the healthcare provider) creates **complex legal and ethical challenges**

  - Clear **guidelines and regulations** are needed to define responsibility and ensure patient safety

Economic
Employment & industry

- AI adoption can significantly reshape entire industries, leading to:

  - **Job displacement** in sectors that rely heavily on routine or manual work

  - **Increased productivity** and efficiency in areas such as manufacturing, logistics, and finance

  - A growing demand for **AI-related roles**, such as data scientists and machine learning engineers

- To minimise negative effects, **governments and businesses must invest in retraining and upskilling programmes** to help workers transition into new roles

Business & innovation

- AI can be a catalyst for **economic growth** by:

  - Enabling **new business models**, such as personalised services or automated customer support

  - Supporting **faster innovation cycles** by improving R&D processes.

  - Reducing operational costs through automation and predictive analytics

- However, **small businesses may struggle** to compete with large companies that have more resources to invest in AI

- Potentially widening **economic inequalities** between organisations

Market dynamics & inequality

- The deployment of AI can:

  - **Concentrate wealth and power** in large tech companies that control key AI tools and data

  - Create **monopolistic advantages**, leading to reduced market competition

  - Require policymakers to consider **new economic models** and **regulation** to ensure fair access to AI technologies and prevent deepening income inequality

Environmental
Energy consumption

- AI systems, especially large-scale models, require vast computing power, which can:

  - Lead to **high electricity usage** and significant **carbon emissions**

  - **Strain power grids** if deployed at scale without renewable energy support

- Efforts must be made to:

  - Optimise AI models to be more **energy-efficient**

  - Encourage the use of **green data centres** powered by **renewable energy** sources

Climate modelling & sustainability

- AI can be a **powerful tool for environmental protection**:

    - Helps in **climate modelling**, predicting weather patterns and analysing environmental data

    - Aids in **optimising energy use**, improving efficiency in smart grids and buildings

    - Supports **sustainable agriculture** by analysing soil, weather, and crop data to reduce waste and overuse of resources

- However, the **positive environmental applications of AI must be weighed against its resource demands**, ensuring that the net impact supports climate goals

E-waste and hardware lifespan

- AI adoption drives demand for **specialised hardware** (e.g. GPUs, TPUs), which:

    - Can shorten the **lifespan of devices** due to rapid advancements in AI capability

    - Increases the volume of **electronic waste**, adding pressure to recycling systems

- Sustainable practices in **hardware design**, **recycling**, and **component reuse** are essential to reduce AI's environmental footprint

Worked Example

Aisha manages a team of software developers.

The team are developing a computer game where the user plays a board game (such as chess) against the computer.

Describe how the computer would use Artificial Intelligence (AI) to play the board game.**[3]**

Answer

- The rules / past moves / decision making algorithms of the game will be stored [1 mark]
- The AI program is trained, by playing many times [1 mark]
- AI will look (ahead) at possible moves [1 mark]
- ... and/or analyse the pattern of past choices [1 mark]
- ... and choose the move most likely to be successful [1 mark]
- Computer could learn how to improve // learn from previous mistakes [1 mark]
- ... by storing the positive/negative result of choices [1 mark]
- ... and changing its future choices [1 mark]