

Week 26

AP Computer Science Principles

Homework bundle for this week

本周作业合集

[exercises.lol](#)

Contents 目录

Topic 5 quiz	2
Exercise sheet 5.1	5
Exercise sheet 5.2	8
Exercise sheet 5.3	11
Exercise sheet 5.4	14
Exercise sheet 5.5	17
Exercise sheet 5.6	21

AP Computer Science Principles

Name: _____ Score: _____

1. A computing innovation is:

- ☐ a new piece of software or hardware
- ☐ a kind of syntax error
- ☐ a data type
- ☐ a loop

2. The digital divide is:

- ☐ the gap between people with and without good access to computing
- ☐ a type of network cable
- ☐ a programming error
- ☐ the speed of a CPU

3. Computing bias is:

- ☐ unfairness built into a program, sometimes unintentionally
- ☐ a fast algorithm
- ☐ a type of hardware
- ☐ always deliberate

4. Crowdsourcing gathers input, content, or money from:

- ☐ a large group of people, usually online
- ☐ a single expert
- ☐ a computer alone
- ☐ no one

5. Copyright gives a creator:

- ☐ control over how their work is copied and used
- ☐ a faster computer
- ☐ free Internet
- ☐ nothing

6. The same innovation can be beneficial to one group and harmful to another.

- ☐ True ☐ False

7. Which factors shape the digital divide? (Select all that apply)

- ☐ income
- ☐ geography
- ☐ age
- ☐ the colour of the device

Tick every correct option.

8. Programs that learn from examples study their _____ data to find patterns.

9. Volunteers helping classify galaxies or count wildlife is an example of _____ science.

10. Effects an innovation's creators never planned are called unintended _____.

AP Computer Science Principles

1. **a new piece of software or hardware**

It can have both good and bad effects.

2. **the gap between people with and without good access to computing**

It includes fast, reliable, affordable connection, not just owning a device.

3. **unfairness built into a program, sometimes unintentionally**

It can treat some groups worse, even by accident.

4. **a large group of people, usually online**

The Internet enables it on a global scale.

5. **control over how their work is copied and used**

It is automatic legal ownership of the work.

6. **True**

A ride-share app helps riders but hurts taxi firms.

7. **income; geography; age**

Income, geography, and age all affect access.

8. **training**

Biased training data gives biased results.

9. **citizen**

Citizen science is a common form of crowdsourcing.

10. **consequences**

They can be good or bad, and appear as people use the tool.

5.1 Beneficial and Harmful Effects

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS computing innovation 计算创新 • unintended consequences 意外后果

Objective

Build the skills to answer exam questions on **beneficial and harmful effects**.

You must be able to:

- explain how a **computing innovation** 计算创新 can have both beneficial and harmful effects
- describe how a single effect may be **beneficial** to some and **harmful** to others
- explain how an innovation can have an impact **beyond its intended purpose**
- identify **unintended consequences** 意外后果

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Both effects

Almost every computing innovation has **both** beneficial and harmful effects, and a single effect may be seen as **good by some** people and **bad by others**.

■ Beyond the intended purpose

An innovation can have an impact **beyond** what its designers intended — an **unintended consequence**.

■ Evaluating

Judge an innovation by **weighing** its benefits against its harms.

2 Practice

2.1 State why a computing innovation can be both beneficial and harmful. [1]

2.2 Give an example of an unintended consequence of a technology. [1]

2.3 State how you should evaluate a computing innovation. [1]

3 Exam-style questions

3.1 A single effect of a technology can be [1]

- **A** only good
 - **B** only bad
 - **C** good for some people and bad for others
 - **D** neither good nor bad
-

3.2 An effect the designers did not intend is [1]

- **A** the main purpose
 - **B** an unintended consequence
 - **C** a syntax error
 - **D** a protocol
-

3.3 Social media connects people but can also spread misinformation.

(a) State one benefit. [1]

(b) State one harm. [1]

(c) State how to judge it overall. [1]

Solutions

2.1 the same effect can help some people while harming others.

2.2 any reasonable example, e.g. smartphones enabling constant contact but also distraction/addiction.

2.3 weigh its benefits against its harms.

3.1 C.

3.2 B.

3.3 (a) it connects people across distances. (b) it can spread misinformation. (c) weigh the benefits against the harms.

5.2 Digital Divide

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS access 获取 • digital divide 数字鸿沟 • opportunities 机会 • equity 公平

Objective

Build the skills to answer exam questions on **the digital divide**.**You must be able to:**

- explain how the **digital divide** 数字鸿沟 describes unequal **access** 获取 to computing and the Internet
- identify factors such as income, geography, and age
- describe how limited access affects **opportunities** 机会
- evaluate efforts to improve **equity** 公平 of access

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ The digital divideThe gap in **access** to computing and the Internet between different groups of people.**■ Factors**Shaped by **income**, **geography** (rural vs urban), and **age**, among others.**■ Effects and equity**Limited access reduces a person's **opportunities** in education and work. Decisions by governments and companies can **widen** or **narrow** the divide.

2 Practice

2.1 Define the digital divide. [1]

2.2 Name two factors that shape the digital divide. [2]

2.3 State how limited Internet access can affect a person.

[1]

3 Exam-style questions

3.1 The digital divide describes unequal

[1]

- **A** prices
 - **B** access to computing and the Internet
 - **C** file sizes
 - **D** network speeds only
-

3.2 Which of these factors shapes the digital divide?

[1]

- **A** income
 - **B** the weather
 - **C** the programming language
 - **D** the screen colour
-

3.3 A rural village has no reliable Internet access.

(a) State one effect on residents' opportunities.

[1]

(b) Name one factor behind the divide here.

[1]

(c) State one way to narrow it.

[1]

Solutions

2.1 the unequal access to computing and the Internet across different groups.

2.2 any two of: income, geography, age.

2.3 it reduces their opportunities in education and work.

3.1 B.

3.2 A.

3.3 (a) fewer education or job opportunities. (b) geography (or income). (c) provide affordable access or build infrastructure.

5.3 Computing Bias

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS bias 偏见 • training data 训练数据 • computing bias 计算偏见

Objective

Build the skills to answer exam questions on **computing bias**.

You must be able to:

- explain how **computing bias** 计算偏见 can be built into a program, sometimes unknowingly
- describe how biased **training data** 训练数据 leads to unfair results
- identify how bias can **harm** particular groups
- propose ways developers can **reduce** bias

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Computing bias

Bias can be **built into** a program, sometimes **without the developers realising** it.

■ Biased training data

If the **training data** used to build a program is biased, the program can produce **unfair** results that **harm** particular groups.

■ Reducing bias

Testing with **diverse** users and data helps reveal hidden bias, and developers can act on it during design and development to **reduce** it.

2 Practice

2.1 Define computing bias. [1]

2.2 State how biased training data causes unfair results. [1]

2.3 State one way developers can reduce bias. [1]

3 Exam-style questions

3.1 Computing bias can be built into a program [1]

- **A** always on purpose
 - **B** sometimes without the developers' awareness
 - **C** only by users
 - **D** never
-

3.2 Testing with diverse users helps to [1]

- **A** add bias
 - **B** reveal hidden bias
 - **C** slow the program
 - **D** compress data
-

3.3 A facial-recognition app works poorly for some groups of people.

(a) State a likely cause. [1]

(b) State one harm this could do. [1]

(c) State one way to reduce the bias. [1]

Solutions

2.1 unfairness built into a program, sometimes without the developers realising it.

2.2 the program learns the bias in the data and repeats it in its results.

2.3 test with diverse users and data (or review the training data).

3.1 B.

3.2 B.

3.3 (a) biased or unrepresentative training data. (b) unfair treatment of the affected groups. (c) test and train with more diverse data.

5.4 Crowdsourcing

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS crowdsourcing 众包 • citizen science 公民科学 • quality 质量 • encryption 加密

Objective

Build the skills to answer exam questions on **crowdsourcing**.

You must be able to:

- explain how **crowdsourcing** 众包 obtains input from a large group
- describe how the Internet **enables** crowdsourcing at scale
- identify examples such as **citizen science** 公民科学, reviews, and collaborative funding
- recognize challenges such as reliability and **quality** 质量 control

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Crowdsourcing

Obtaining input, ideas, or content from a **large group of people**. The **Internet** enables it on a global scale.

■ Examples

Citizen science (the public helps classify data), product **reviews**, and collaborative **funding**.

■ Benefits and challenges

Benefits include **diverse contributions** and shared effort; challenges include the **reliability** and **quality control** of crowdsourced data.

2 Practice

2.1 Define crowdsourcing. [1]

2.2 Give one example of crowdsourcing. [1]

2.3 State one challenge of crowdsourced data. [1]

3 Exam-style questions

3.1 Crowdsourcing obtains input from [1]

- **A** one expert
 - **B** a large group of people
 - **C** a single computer
 - **D** no one
-

3.2 Crowdsourcing is enabled at a global scale by [1]

- **A** the Internet
 - **B** encryption
 - **C** a compiler
 - **D** a single server
-

3.3 A science project asks the public to classify photos of galaxies.

(a) Name this practice. [1]

(b) State one benefit. [1]

(c) State one challenge. [1]

Solutions

2.1 obtaining input, ideas, or content from a large group of people.

2.2 any one of: citizen science, online reviews, crowdfunding.

2.3 the reliability or quality of the contributed data.

3.1 B.

3.2 A.

3.3 (a) citizen science (a form of crowdsourcing). (b) many diverse contributors share the effort. (c) ensuring the data is reliable and good quality.

5.5 Legal and Ethical Concerns

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS ethical 伦理 • creative commons 知识共享 • copyright 版权 • intellectual property 知识产权
• open-source 开源

Objective

Build the skills to answer exam questions on **legal and ethical concerns**.

You must be able to:

- explain how **intellectual property** 知识产权 and **copyright** 版权 protect a creator's work
- describe how a **Creative Commons** 知识共享 or open-source license grants permission
- identify **ethical** 伦理 concerns of collecting and using personal data
- explain the difference between using material **legally** and **ethically**

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Protecting creative work

Copyright and **intellectual property** protect the work of a creator, so others cannot use it freely without permission.

■ Licenses

A **Creative Commons** or **open-source** license **grants permission** to use others' work under stated conditions (such as giving credit).

■ Legal vs ethical

Something can be **legal** but still raise **ethical** concerns (e.g. collecting personal data). Developers have responsibilities toward **privacy** and honest use of others' work.

2 Practice

2.1 State what copyright protects. [1]

2.2 State what a Creative Commons license does. [1]

2.3 State the difference between using material legally and using it ethically. [2]

3 Exam-style questions

3.1 Copyright protects the [1]

- **A** hardware
 - **B** work of a creator
 - **C** Internet itself
 - **D** processor
-

3.2 A Creative Commons license [1]

- **A** blocks all use of a work
 - **B** grants permission to use a work under conditions
 - **C** deletes files
 - **D** encrypts data
-

3.3 A student copies an image into a school project.

(a) Name what protects the original creator's work. [1]

(b) Name a license type that might permit reuse. [1]

(c) State one responsibility toward others' work.

[1]

Solutions

2.1 the work of a creator (their original creative work).

2.2 it grants others permission to use the work under stated conditions.

2.3 legal use follows the law; ethical use also respects fairness, privacy, and honesty even where the law allows it.

3.1 B.

3.2 B.

3.3 (a) copyright (intellectual property). (b) a Creative Commons or open-source license.
(c) credit the creator and respect the license terms.

5.6 Safe Computing

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS encryption 加密 • symmetric 对称 • asymmetric 非对称 • phishing 钓鱼 • malware 恶意软件

Objective

Build the skills to answer exam questions on **safe computing**.

You must be able to:

- explain how **personally identifiable information (PII)** 个人身份信息 can be misused
- describe threats such as **phishing** 钓鱼, malware, and social engineering
- explain how **encryption** 加密 protects data
- distinguish **symmetric** 对称 from **asymmetric** 非对称 encryption

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ PII and threats

Personally identifiable information (PII) — such as a name, address, or ID number — can be misused if exposed. Common threats include **phishing** (fake messages that trick you), **malware**, and **social engineering**.

■ Encryption

Encryption encodes data so that only authorized users can read it.

- **Symmetric** encryption uses **one shared key** for both encoding and decoding.
- **Asymmetric** encryption uses a **public + private key pair**.

Safe practices include strong **authentication** and cautious sharing.

2 Practice

2.1 State what PII is. [1]

2.2 Name two common security threats. [2]

2.3 State what encryption does. [1]

3 Exam-style questions

3.1 PII stands for personally identifiable [1]

- **A** internet
 - **B** information
 - **C** interface
 - **D** index
-

3.2 Encryption protects data by [1]

- **A** deleting it
 - **B** encoding it so only authorized users can read it
 - **C** compressing it
 - **D** sorting it
-

3.3 A fake email tricks a user into revealing a password.

(a) Name this type of threat. [1]

(b) Name one safe practice that reduces the harm. [1]

(c) State the difference between symmetric and asymmetric encryption.

[1]

Solutions

2.1 personally identifiable information — data that can identify a person, which can be misused if exposed.

2.2 any two of: phishing, malware, social engineering.

2.3 it encodes data so that only authorized users can read it.

3.1 B.

3.2 B.

3.3 (a) phishing. (b) strong authentication, or being cautious about sharing information (any one). (c) symmetric uses one shared key; asymmetric uses a public and private key pair.