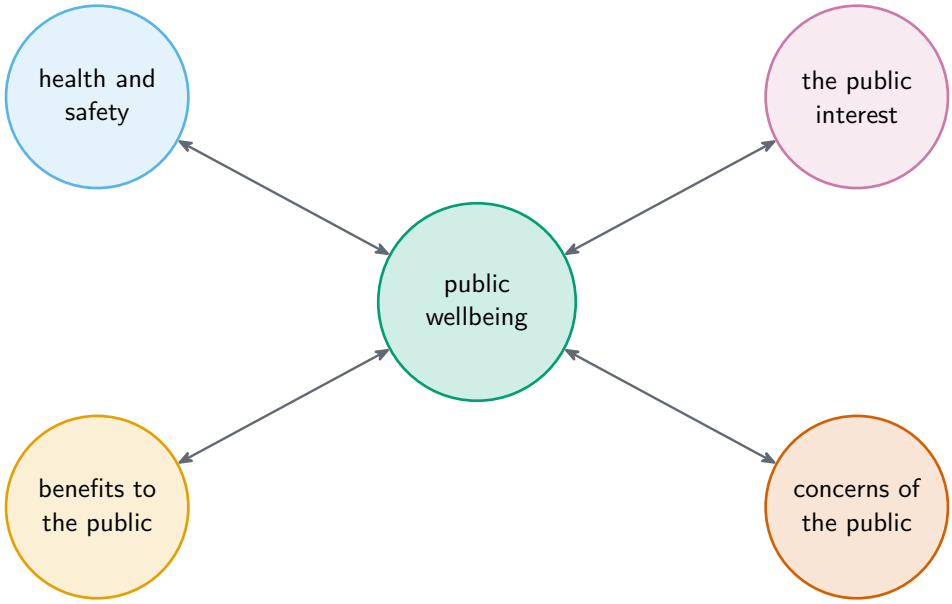
Impact of Computing

AP Computer Science Principles

Beneficial and Harmful Effects

Every computing innovation can be used in ways that **help** and ways that **harm** –often the same technology does both. A social network connects people **and** can spread misinformation; automation raises productivity **and** can remove jobs. Effects are frequently **unintended**: creators cannot foresee every use. When you evaluate a computing innovation, weigh its benefits and harms on people and society, and remember that harms are not always deliberate.



Computing affects the public's wellbeing in several ways

The Digital Divide

The **digital divide** 数字鸿沟 is the unequal access to computing and the Internet across groups –by income, geography, age, or country. Those with access gain education, jobs, and services; those without fall further behind. The divide is shaped by economic, social, and geographic factors, and efforts to close it (affordable devices, public access, infrastructure) aim to make computing's benefits fairer.

Computing Bias

Bias 偏见 can be built into computing systems –often unintentionally. If the **data** used to build a system reflects existing prejudice, or if the designers' assumptions are one-sided, the system can produce **unfair** results (for example, a hiring tool that favors one group). Bias can enter at every stage –data collection, design, and use –so systems should

be tested for fairness across different groups. Recognizing that ”the computer said so” is not the same as ”fair” is an important habit.

Crowdsourcing

Crowdsourcing 众包 obtains input, ideas, or funding from a **large group of people**, usually online. It harnesses the knowledge and effort of many –mapping projects, product reviews, citizen science, and **crowdfunding** all rely on it. The Internet makes crowdsourcing possible at a scale and speed never before achievable, letting a project draw on contributors worldwide.

Legal and Ethical Concerns

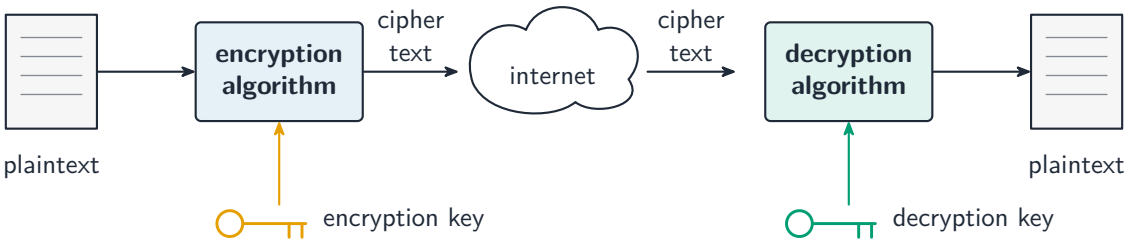
Computing raises questions of law and ethics:

- **Intellectual property** 知识产权 and **copyright** 版权 protect creators' work; using it may require permission or a license. **Open-source** 开源 and **Creative Commons** licenses let creators share work under stated terms.
- **Plagiarism** 抄袭–using others' work as your own –is unethical and often illegal.
- Collecting and using personal data raises **privacy** questions about consent and misuse.

Just because something is technically possible does not make it legal or ethical.

Safe Computing

Protecting personal data is a shared responsibility. Key ideas:



Encryption scrambles plaintext with a key; only the key can decrypt it

- **Personally identifiable information (PII)** 个人身份信息 (name, address, ID numbers) should be shared carefully, because it can be misused for **identity theft** 身份盗窃.
- Threats include **phishing** 网络钓鱼 (tricking you into revealing information), **malware** 恶意软件, and weak passwords.
- Defenses include strong, unique **passwords**, **multi-factor authentication** 多因素认证, **encryption** 加密 (scrambling data so only authorized people can read it), and keeping software updated.

Encryption is the central tool for keeping data private in transit and storage. Being a responsible computer user means protecting your own and others' information.

Exam skill: be able to identify the beneficial and harmful effects of a given innovation, explain a privacy or security risk, and name a safe-computing practice that addresses it.

Exam tips

- Argue **both** the beneficial and harmful effects of a computing innovation —a balanced answer scores best.
- Use correct terms for data concerns: **PII**, privacy, security, and **algorithmic bias**.
- Explain how **crowdsourcing** and large data sets create value and raise new risks.
- Distinguish the **digital divide** (access) from bias (fairness) and give a concrete example of each.
- Tie every claim to a specific innovation and effect, as the written response demands.