AP CYBERSECURITY • EXERCISE SHEET

2.1 Cyber Foundations

Name: _____ Class: _____ Date: _____ **Total: 55 marks**

KEY WORDS risk 风险 • accept 接受 • likelihood 可能性 • severity 严重性 • transfer 转移

Objective

Build the skills to answer exam questions on the **CIA triad** 信息安全三要素, **social engineering** 社会工程学, **adversaries** 攻击者, the **phases of an attack** 攻击阶段, **risk assessment** 风险评估, and **security controls** 安全控制.

You must be able to:

- name the seven social-engineering tactics and identify which one a scenario shows
- classify an adversary by motive and capability
- place an action in the correct phase of a cyberattack
- assess a risk from likelihood and severity, and say whether a rating is quantitative or qualitative
- choose a risk response (avoid, transfer, mitigate, accept) and justify it
- classify a control by type *and* by function, and explain why defense in depth is needed

1 Worked examples

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

■ Naming the social-engineering tactic

Ask **what feeling the message manufactures**, not what it claims to be. A pretext is the *cover story*; the tactic is the *pressure*.

> "This is Mr Chen from Finance. The transfer must clear in the next twenty minutes or the auditors will fine the department."

- Claiming to be Finance = **pretexting** (the invented reason for contact).
- Naming a manager to borrow their power = **authority**.
- A twenty-minute deadline = **urgency**.
- Threatening a fine = **intimidation**.

A scenario may show more than one tactic. Quote the words that carry each one; a bare label earns nothing. The defence never changes: **verify through a separate trusted channel** before acting.

■ Placing an action in the attack phase

Six phases run in order, and each has one give-away question:

Phase	The give-away
Reconnaissance	still *outside* — reading public (OSINT) information
Initial access	first foothold — a phishing click, a stolen password
Persistence	keeping the foothold — a RAT, a rootkit, a C2 channel
Lateral movement	reaching *further* — escalating privileges, new accounts
Taking action	acting on the goal — collecting, exfiltrating, destroying
Evading detection	covering up — deleting logs, removing planted files

Example. An adversary already inside a workstation uses a stolen admin password to open the file server. Not initial access — they were already in. Reaching further with higher privilege is **lateral movement**.

■ Assessing and rating a risk

Risk needs all three: a **threat** that can exploit a **vulnerability** to compromise an **asset**.

Rate it from two factors, and say what drives each:

- **Likelihood** — the target's *value*, the *skill* needed to exploit it, and the adversary's *motivation and capability*.
- **Severity** — usually financial, but also reputational and operational.

Example. A clinic keeps patient records on an unencrypted laptop taken home nightly. Likelihood: **high** — medical data is valuable, and reading an unencrypted disk needs almost no skill. Severity: **high** — a breach carries legal penalties, lost trust and clinic downtime. Rating: **high risk**. That is a *qualitative* rating; "an $80,000 expected annual loss" would be *quantitative*.

■ Choosing the risk response

Response	What it does	When it fails
Avoid	stop the activity	impossible if the activity is the organisation's purpose
Transfer	move the burden (insurer, government, customer)	the reputational damage does not transfer
Mitigate	add controls to cut likelihood or impact	never reaches zero
Accept	live with what is left	only for **residual risk** you can afford

An organisation favours controls that are **cost effective** — costing less to install and maintain than the loss they prevent.

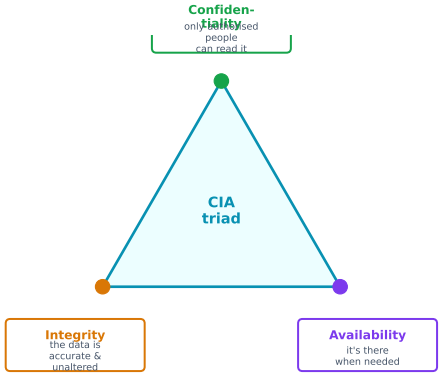
Example. The clinic cannot stop treating patients, so avoidance is out. Full-disk encryption is cheap and cuts the likelihood to near zero, so **mitigate**; insurance for the remainder is **transfer**; whatever is left is accepted.

Classifying a control twice

Every control has a **type** (where it acts) *and* a **function** (what it does), and the exam asks for both.

	Preventative	Detective	Corrective
Physical	door lock, bollard	CCTV camera	repairing a broken card reader
Technical	firewall, encryption	IDS, SIEM	patching, IPS
Managerial	password policy	access review	incident response plan

A camera is **physical** by type and **detective** by function. Reading the row and the column separately is what makes it two marks, not one.



CIA triad: Confidentiality · Integrity · Availability (core security goals)

2 Practice

2.1 State the three goals of the **CIA triad** and give one control that supports each. [6]

2.2 Name the social-engineering tactic in each message, and quote the words that show it.

(a) "Only three licences left at this price - the offer closes tonight." [2]

(b) "Everyone else on your team has already completed the security form." [2]

(c) "Hi, it's Dan - we met at Priya's leaving lunch. Can you resend that file?" [2]

2.3 Identify the type of adversary in each case.

(a) A group defaces a mining company's website to publicise its pollution record. [1]

(b) A dismissed employee still holding a valid login copies the client list. [1]

(c) A gang deploys ransomware across hospitals for payment in cryptocurrency. [1]

(d) A teenager runs a downloaded exploit kit, not knowing how it works. [1]

2.4 Name the phase of a cyberattack shown by each action.

(a) Reading employee job titles from a public networking site. [1]

(b) Installing a remote access trojan so access survives a reboot. [1]

(c) Deleting the server's authentication logs. [1]

(d) Copying the customer database to an external server. [1]

2.5 Define **risk** in terms of a threat, a vulnerability and an asset, and give **two** examples of an asset that is not physical. [4]

2.6 A school rates a risk as "likely, high impact". A second school rates the same risk as "$40,000 expected annual loss".

(a) Which rating is qualitative and which is quantitative? [2]

(b) State **one** advantage of the quantitative rating for a governing board. [1]

2.7 Classify each control by type **and** by function.

(a) A firewall. [2]

(b) A written incident response plan. [2]

(c) A security guard at the server-room door. [2]

(d) Restoring files from backup after ransomware. [2]

3 Exam-style questions

3.1 Encrypting a stored file mainly protects which CIA goal? [1]

- **A** availability
- **B** confidentiality
- **C** integrity
- **D** authority

3.2 An organisation buys insurance against a cyber loss. Which risk response is this? [1]

- **A** avoid
- **B** transfer
- **C** mitigate
- **D** accept

3.3 An adversary already has a foothold on one workstation and now escalates privileges to reach the finance server. Which phase is this? [1]

- **A** reconnaissance
- **B** initial access
- **C** lateral movement
- **D** evading detection

3.4 Which is the best example of a **detective** control? [1]

- **A** a bollard outside the entrance
- **B** a security incident and event management (SIEM) system
- **C** full-disk encryption
- **D** an intrusion prevention system that blocks the connection

3.5 A regional water utility runs its treatment plant from a control network reachable from the office network. Operators sign in with a shared password that has not changed in four years. An engineer clicks a link in an email claiming to be an urgent regulator notice; malware installs and contacts an outside server nightly.

(a) Identify the social-engineering tactic in the email and quote the words that show it. [2]

(b) Name the phase reached when the malware contacts an outside server nightly, and explain what the adversary gains from it. [2]

(c) Assess the risk to the treatment plant. Refer to **both** likelihood and severity, and justify each from the scenario. [4]

(d) The utility cannot stop treating water. Choose a risk response for the shared password and justify why the other three are unsuitable here. [4]

(e) The utility adds a password policy, network segmentation between office and control networks, and a locked control room. Explain how this illustrates **defense in depth**, naming the layer each control defends. [4]

Solutions

2.1 confidentiality - only authorised people can read the data, e.g. encryption; integrity - the data is accurate and unaltered, e.g. a hash or checksum; availability - data and services are there when needed, e.g. a backup or redundant server. Accept any control that genuinely serves the named goal.

2.2 (a) **scarcity** - "only three licences left" / "closes tonight" invents limited availability. Accept urgency as a second tactic if quoted from "closes tonight". (b) **consensus** - "everyone else on your team has already" creates social pressure to conform. (c) **familiarity** - claiming a shared acquaintance, "we met at Priya's leaving lunch", to borrow trust. A bare label with no quotation scores 1 of 2.

2.3 (a) hacktivist - motivated by a social or environmental cause, not money. (b) insider - holds legitimate credentials; motive is revenge. (c) transnational criminal organisation - ransomware for financial gain. (d) script kiddie - uses others' tools without understanding them.

2.4 (a) reconnaissance - public OSINT, still outside the system. (b) persistence - keeping access without regaining it. (c) evading detection. (d) taking action - exfiltrating the target data.

2.5 risk occurs when a threat can exploit a vulnerability to compromise an asset; any two non-physical assets, e.g. data, intellectual property, reputation, financial resources.

2.6 (a) "likely, high impact" is qualitative; "$40,000 expected annual loss" is quantitative. (b) any one of: it can be compared directly against the cost of a control, so the board can see whether a fix is cost effective; it can be added across risks into a budget; it removes the ambiguity of a word like "high".

2.7 (a) technical, preventative. (b) managerial, corrective - it restores operations after an incident; accept preventative only with a justification that it reduces damage before an incident. (c) physical, preventative. (d) technical, corrective.

3.1 B. Encryption hides the contents from anyone without the key, which is confidentiality.

3.2 B. Shifting the burden to another entity is transference. Note the loss of reputation does not transfer.

3.3 C. The foothold already exists, so this is not initial access; reaching further with higher privilege is lateral movement.

3.4 B. A SIEM identifies attacks as they occur. A bollard and encryption prevent; an IPS that blocks the connection is corrective.

3.5 (a) **urgency** - "urgent regulator notice" imposes a deadline so the engineer acts before checking. Accept **authority** if the answer quotes the impersonation of a regulator.

(b) **persistence**. The nightly call-out is a command-and-control channel, so the adversary keeps access without having to phish again, and can send new commands and retrieve output.

(c) Likelihood **high** because: a water utility is a high-value target for a cyberterrorist or hostile state; a four-year-old shared password requires almost no skill to abuse; and

the control network is reachable from the office network, so one phished user is enough. Severity **high** because: loss of availability at a treatment plant threatens public health, and the operational and reputational damage far exceeds the financial cost. Overall rating high/severe.

(d) **Mitigate** - replace the shared password with individual accounts and multi-factor authentication, which cuts the likelihood at low cost. Avoidance is not possible because treating water is the utility's purpose. Transference (insurance) does not stop the plant being taken offline and cannot restore public trust; acceptance is unjustifiable when severity is loss of safe water.

(e) Defense in depth uses several controls of different types so that bypassing one still leaves others. Password policy defends the **human**/managerial layer; segmentation defends the **network** layer, so a phished office account no longer reaches the control system; the locked room defends the **physical** layer. Each threat meets the control best suited to it, and one failure no longer exposes the plant.