

Exercise 1

Module 1: How Computers Work?

1.

Complete the input/output cycle diagram and explain how all three stages depend on each other:

Input: Data enters via _____ (e.g., _____ or _____)

Process: The _____ executes instructions on data currently in _____

Output: Processed data leaves via _____ (e.g., _____ or _____)

2.

Program Life cycle: A Python file *irrigation.py* sits on the SSD of a Raspberry Pi. A farmer double-clicks to run it.

Identify what exists at each stage:

- (a) before running,
- (b) while running,
- (c) after it finishes.

For each stage, state what is in RAM and what is on the SSD.

3.

Decode the Error A student receives the error: `"FileNotFoundError: /home/pi/data/log.csv"`. Using your knowledge of file systems, answer: (a) What are the three parts of this path? (b) What does this error most likely mean? (c) Is this a hardware failure, a software bug, or a file-system error?

4.

Put the following concepts in the correct logical hierarchy from physical to abstract:

- ☐ Operating System (OS)
- ☐ Transistors / electrical signals
- ☐ Python script (frost_check.py)
- ☐ CPU instruction set (machine code)
- ☐ Process running in RAM

5.

A drone used in precision agriculture runs an embedded Linux system. Its flight controller crashes mid-mission with a message: *"Killed: out of memory"*. (a) Which hardware component is exhausted? (b) Why can the CPU not simply continue using SSD space instead? (c) What is one practical solution an engineer could apply?