

Section 1.1 — Introduction to Microcontrollers (Mazidi)

Chapter 1 · Section 1.1 — Exercises (Mazidi)

Problems are paraphrased to respect copyright. See *Mazidi*, Chapter 1 §1.1 (“Introduction to Microcontrollers”), PDF ~pp. 15–17.

1) True or False. A general-purpose microprocessor has on-chip ROM.

Answer: False.

Why: General-purpose microprocessors (e.g., x86) provide only the CPU and **require external ROM/RAM and I/O**. (See §1.1, PDF p. ~15.)

2) True or False. Generally, a microcontroller has on-chip ROM.

Answer: True.

Why: A microcontroller integrates CPU + **program ROM/Flash + RAM + I/O** on a **single chip**. (§1.1, p. ~15–16.)

3) True or False. A microcontroller has on-chip I/O ports.

Answer: True.

Why: On-chip **GPIO and peripheral interfaces** (timers/serial, etc.) are part of the MCU integration. (§1.1, p. ~16.)

4) True or False. A microcontroller has a fixed amount of RAM on the chip.

Answer: True.

Why: The MCU’s **on-chip RAM size is fixed** for a given device family/part number. (§1.1, p. ~15–16.)

5) What components are usually put together with the microcontroller onto a single chip?

Answer: CPU, **program ROM/Flash**, **data RAM**, **I/O ports**, and typically **timers/counters** and **serial peripherals** (UART/SPI/I²C); many devices also integrate **ADC/PWM/interrupt controller**. (§1.1, p. ~16.)

6) Intel’s Pentium chips used in Windows PCs need external _____ and _____ chips to store data and code.

Answer: RAM and ROM (BIOS/Flash).

Why: The Pentium is a **microprocessor**—it relies on **external memory** for both data and program storage. (§1.1, p. ~15.)

7) List three embedded products attached to a PC.

Example answers: Keyboard, mouse, printer.

(Other valid examples: scanner, webcam, external modem, game controller.) (General §1.1 examples.)

8) Why would someone want to use an x86 as an embedded processor?

Answer (concise): To leverage **PC compatibility and ecosystem**—abundant **development tools**, existing **software/OS support**, and **familiarity/performance** for certain embedded applications. (§1.1 context.)

9) Give the name and the manufacturer of some widely used 8-bit microcontrollers.

Answer (any three):

- **8051 family** — originally **Intel**; produced by many vendors (e.g., **NXP**, **Silicon Labs**, **Atmel/Microchip**).
 - **PIC** — **Microchip Technology**.
 - **AVR** — originally **Atmel** (now **Microchip**).
- (Also acceptable: **Zilog Z8**, **Motorola/Freescale 68HC05/08**.) (*Historical overview in §1.1.*)
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10) In Question 9, which one has the most manufacture sources?

Answer: 8051 family.

Why: It has been second-sourced by many manufacturers for decades. (*§1.1.*)

11) In a battery-based embedded product, what is the most important factor in choosing a microcontroller?

Answer: Power consumption (low-power operation).

Why: Directly impacts **battery life** (sleep/active current, clocking options). (*§1.1 design considerations.*)

12) In an embedded controller with on-chip ROM, why does the size of the ROM matter?

Answer: It **limits the maximum program size** (firmware features, tables, libraries) and **affects cost/part selection**. (*§1.1.*)

13) In choosing a microcontroller, how important is it to have multiple sources for that chip?

Answer: Important.

Why: Multiple sources reduce **supply-risk**, improve **price/lead-time**, and ensure **long-term availability** and drop-in replacements (as with many **8051** parts). (*§1.1.*)

14) What does the term “third-party support” mean?

Answer: Availability of **tools and resources from companies other than the MCU vendor**—e.g., **compilers, assemblers, debuggers, IDEs, RTOS, programmers, evaluation boards, libraries**. Strong third-party support shortens development time. (*§1.1.*)
