

7-1 Computer Configuration

Point!

The Five Major Components of a Computer

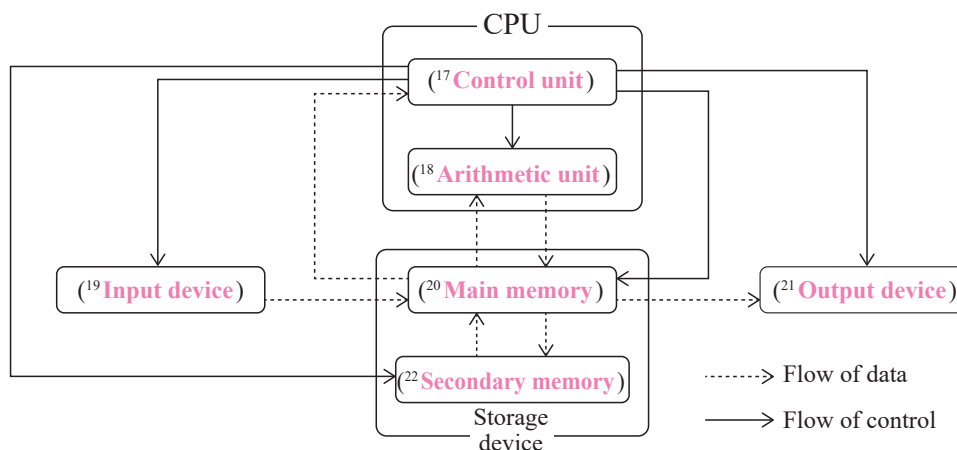
- (1) ⁽¹⁾**Hardware** : Devices such as the main computer unit and peripheral devices.
- (2) Peripheral devices : Devices used by connecting them to a computer.
 <Examples> Keyboard, mouse, display, printer, etc.
- (3) The five major components of a computer : A computer is comprised of the following five components:
⁽²⁾**the control unit**, ⁽³⁾**the arithmetic unit**, ⁽⁴⁾**the memory unit**,
⁽⁵⁾**the input unit**, and ⁽⁶⁾**the output unit**.
 - The control unit and arithmetic unit together are referred to as the ⁽⁷⁾**CPU (central processing unit)**.
 - Storage devices are divided into ⁽⁸⁾**main memory**, which temporarily stores programs and data, and ⁽⁹⁾**secondary memory**, which is used for long-term storage. 🗣️

<Roles of the Five Major Components of a Computer>

Five major components		Role	Example of major component
Control unit	CPU	Executes a computer's ⁽¹⁰⁾ instructions and issues ⁽¹¹⁾ commands to each function.	CPU
Arithmetic unit		Performs ⁽¹²⁾ calculations .	
Storage device	Main memory device (Memory)	⁽¹³⁾ Temporarily stores programs, data, etc.	Main memory
	Secondary memory (Storage)	For ⁽¹⁴⁾ long-term storage of programs and data.	Hard disk, SSD, USB memory
Input device		⁽¹⁵⁾ Inputs information from external sources.	Keyboard, mouse, scanner
Output device		⁽¹⁶⁾ Outputs information outside of the computer.	Display, printer



<Relationship of the Five Major Components of a Computer>

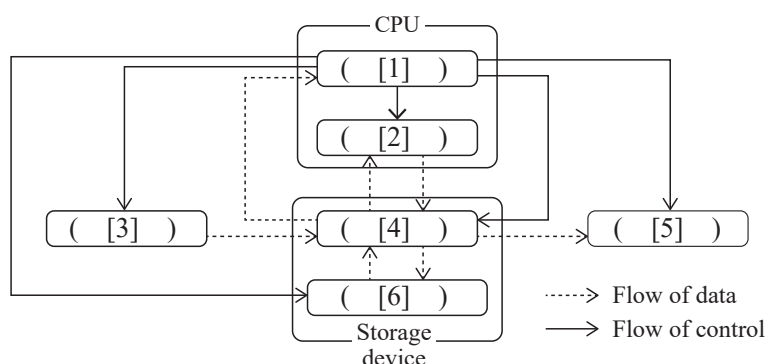


- (4) ⁽²³⁾**Interface**) : A component that mediates the exchange of information. It is used for connecting the main computer and peripheral devices.
- [1] ⁽²⁴⁾**USB**) : The most widely used interface for computer peripheral devices.
Compatible with printers, keyboards, and external hard drives.
- [2] ⁽²⁵⁾**HDMI**) : A communication standard that allows video, audio, and other data to be transmitted through a single cable.
Compatible with digital televisions and audio equipment.
- [3] ⁽²⁶⁾**Ethernet**) : A communication standard used in wired LANs at home, the office, etc.
Compatible with devices such as hubs and routers. 🌐

Warm Up

Answer the following questions.

- (1) The following diagram represents the relationship between computer components. Choose the appropriate device name that best fits into the blanks [1] to [6] from the options **A** to **F**, and answer using the letters.



- | | | |
|--------------------------|-----------------------------|---------------------------|
| A Input device | B Output device | C Control unit |
| D Arithmetic unit | E Main memory device | F Secondary memory |

- (2) Choose all of the following options from **A** to **H** that are output devices, and answer using the letters.

- | | | | |
|-------------------|------------------|--------------------|---------------------|
| A Memory | B Display | C SSD | D Mouse |
| E Keyboard | F Printer | G Hard disk | H USB memory |

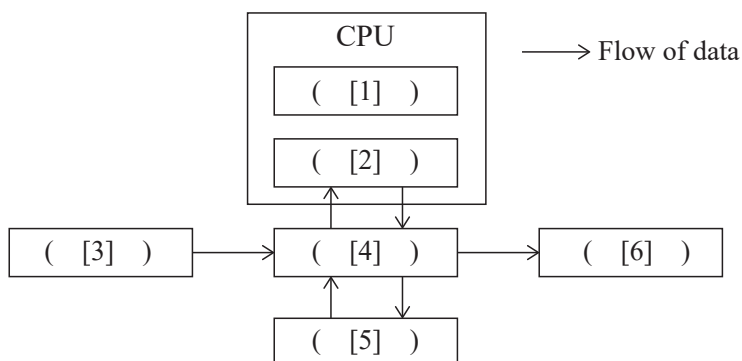
Explanation

- (1) [1] Control unit, because the flow of control is directed towards all devices. **C**
 [2] Among the components of the CPU, [1] is the control unit; therefore, the arithmetic unit. **D**
 [3] The starting point of the data flow; therefore, the input device. **A**
 [4] Among storage devices, this is identified as the main memory because data flows directly into it from the input device. **E**
 [5] Marks the end of the data flow; therefore, an output device. **B**
 [6] Among storage devices, [4] is the main memory; therefore, the secondary memory. **F**
- (2) **B, F**

Try

Answer the following questions.

- (1) The following diagram represents the relationship between computer components. Choose the appropriate device name that best fits into the blanks [1] to [6] from the options **A** to **F**, and answer using the letters. Note that the order of blanks [1] and [2] does not matter.



- | | | |
|--------------------------|-----------------------------|---------------------------|
| A Input device | B Output device | C Control unit |
| D Arithmetic unit | E Main memory device | F Secondary memory |

- (2) Choose all computer components or peripheral devices corresponding to the following [1] to [5] from the options **A** to **I** below, and answer using the letters.

- | | | |
|-----------------------------------|------------------------|----------------------|
| [1] Arithmetic unit, control unit | [2] Main memory device | [3] Secondary memory |
| [4] Input device | [5] Output device | |

- | | | |
|--------------------|---------------------|------------------|
| A Memory | B Display | C SSD |
| D Mouse | E Keyboard | F Printer |
| G Hard disk | H USB memory | I CPU |

- (3) Choose the term that best fits into the blanks [1] and [2] in the following sentences from the options **A** to **D** below, and answer using the letters.

([1]) is called the main memory and exchanges data directly with the CPU. ([2]) is also called secondary memory and serves the role of storing large amounts of data.

- | | |
|--------------------|-------------------|
| A Memory | B Hardware |
| C Interface | D Storage |

- (4) What is the interface described by each of the following [1] to [3]?

- [1] An interface that connects devices to output video and audio through a single cable.
 [2] The most commonly used interface for computer peripheral devices.
 [3] Communication standard used for wired LANs in homes, offices, etc.

Exercise

1 Cover the **Point!** section on pages 84 and 85 with a red sheet and test yourself by writing the items in order in your notebook.

2 Answer the following questions.

(1) Choose the most appropriate explanation of the control unit, which is one of the five major components of a computer from the options **A** to **D** below, and answer using the letter.

- A** It is a device that performs calculations.
- B** It is a device that executes a computer's instructions and issues commands to each function.
- C** It is a device for temporarily storing programs and data.
- D** It is a device for inputting information from external sources.

(2) Choose the names of the devices that correspond to computer devices and peripheral devices [1] to [5] from the options **A** to **E** below, and answer using the letters.

- | | | |
|-----------------------------|---------------------------|--|
| [1] Display | [2] HDD | [3] Keyboard |
| [4] CPU | [5] Main memory | |
| A Input device | B Output device | C Control unit, arithmetic unit |
| D Main memory device | E Secondary memory | |

(3) Choose all the peripheral devices from the options **A** to **F**, and answer using the letters.

- | | | |
|------------------|-------------------|---------------------|
| A Display | B SSD | C Memory |
| D CPU | E Keyboard | F USB memory |

(4) Choose one correct statement regarding interfaces from the options **A** to **D** below, and answer using the letter.

- A** Devices that are not the computer itself but are used by connecting to a computer.
- B** Devices such as the computer itself and peripheral devices.
- C** Devices for temporarily storing programs and data.
- D** A component that mediates the exchange of information. It is used for connecting the main computer and peripheral devices.

(5) Choose the corresponding interface for each of the following peripheral devices [1] to [3] from the options **A** to **D**, and answer using the letters.

- | | | | |
|-------------------|---------------|---------------------|--------------|
| [1] Keyboard | [2] Router | [3] Audio equipment | |
| A Ethernet | B HDMI | C SSD | D USB |

Point!

Hardware and Software

- (1) Hardware : Devices such as the main computer unit and peripheral devices.
 <Examples> CPU, memory, storage, etc.
- (2) (¹Software) : Programs and data that operate on hardware.
- [1] (²System software) : Software necessary for operating the hardware.
- [2] (³Operating system (OS)) : A type of system software responsible for the basic functions of a computer. An OS has management functions such as task management, memory management, and file management.
 <Examples> Windows, macOS, Android OS, etc.
- [3] (⁴Application software) : Software that operates on top of system software. Also known as application software.
 <Examples> Word processing software, spreadsheet software, etc.
- (3) (⁵Device driver) : A program that controls communication between a connected device and software on a computer. Also known simply as a “driver.” 🗣️

Warm Up

For the following statements **A** to **D** about an OS, mark “○” if the statement is appropriate, and “×” if it is inappropriate.

- A** Software used to perform specific tasks.
- B** Smartphones do not come equipped with an OS.
- C** A type of system software essential for operating the hardware.
- D** Application software cannot run without system software.

Explanation

- A:** An explanation about application software. Therefore, ×
- B:** Smartphones are equipped with an OS. For example, iPhones are equipped with iOS, while Android phones run on Android OS. Therefore, ×
- C:** An OS is a type of system software responsible for the basic functions of a computer. Therefore, ○
- D:** Application software is software that operates on top of system software. Therefore, ○

Try

Answer the following questions.

- (1) Complete the following sentences by filling in the blanks [1] to [3] with the appropriate terms.

Types of software include ([1]) software and ([2]) software. ([1]) software includes ([3]). In the case of computers, examples are Windows and macOS. Additionally, ([2]) software includes word processing software and spreadsheet software.

- (2) What is the term for software that is used to control and operate devices connected to a computer?
- (3) For the following statements **A** to **D**, answer with “a” if the statement is about operating systems or “b” if the statement is about application software.
- A** A program executed on a computer that is designed for a specific purpose.
 - B** A program that controls software and hardware on a computer system.
 - C** Includes word processing software and spreadsheet software.
 - D** Included in the system software.

Exercise

- 1** Cover the **Point!** section on page 88 with a red sheet and test yourself by writing the items in order in your notebook.

- 2** Answer the following questions.

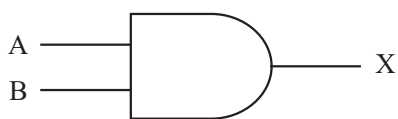
- (1) Choose all the devices and software corresponding to the following [1] to [3] from the options **A** to **F** below, and answer using the letters.
- | | | |
|----------------------|-------------------------------|---------------------------------------|
| [1] Operating system | [2] Hardware | [3] Application software |
| A Memory | B Spreadsheet software | C Windows |
| D macOS | E CPU | F Document processing software |
- (2) Choose one correct statement regarding device drivers from the options **A** to **D** below, and answer using the letter.
- A** A type of system software. Examples include, Windows, macOS, etc.
 - B** Also referred to as application software.
 - C** A program that controls communication between the devices connected to a computer and the software.
 - D** The software necessary for operating hardware.

7-3 Logic Circuits

Point!

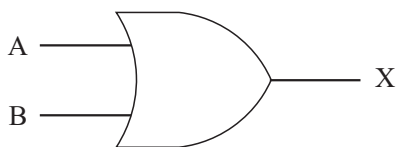
1 Logic Circuits

- (1) (¹**Logical operations**) : Operations performed using combinations of the numbers 0 and 1. In computers, “1” is processed as true and “0” as false.
- (2) (²**Logic circuit**) : A circuit designed to perform logical operations.
- (3) (³**Truth table**) : A table that shows all possible combinations of inputs and outputs for a logic circuit.
- (4) (⁴**AND gate (logical conjunction circuit)**) : A circuit that outputs 1 only when all inputs are 1.



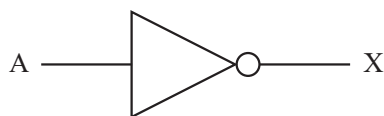
Input		Output
A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

- (5) (⁵**OR gate (logical disjunction circuit)**) : A circuit that outputs 1 if at least one of the inputs is 1.



Input		Output
A	B	X
0	0	0
0	1	1
1	0	1
1	1	1

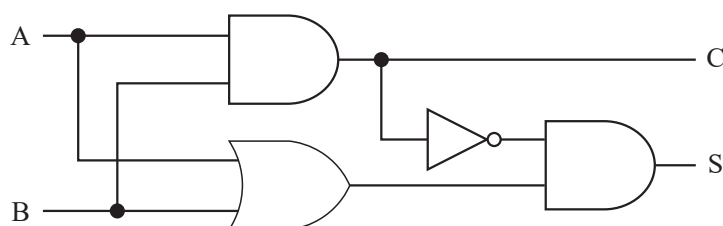
- (6) (⁶**NOT circuit (inverter circuit)**) : A circuit that outputs the opposite result of the input.



Input	Output
A	X
0	1
1	0

2 Half Adder Circuit and Full Adder Circuit

- (1) (⁷**Half adder circuit**) : A circuit representing the addition of single-digit numbers, composed of AND, OR, and NOT gates.



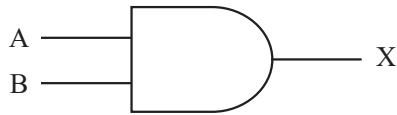
Input		Output	
A	B	C	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

- (2) (⁸**Full adder circuit**) : A circuit that considers carry from the lower bit and carry to the higher bit.

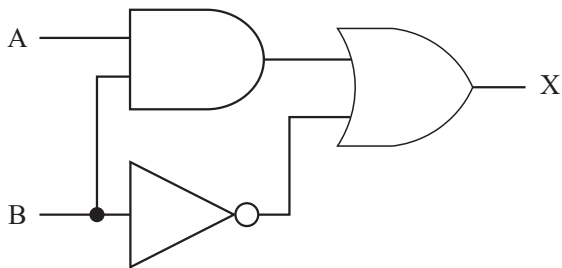
Warm Up

Answer the following questions.

- (1) Name the following logic circuit and create a truth table.



- (2) A circuit was created by combining logic circuits as shown in the following diagram. In this case, create a truth table for inputs A, B, and output X.



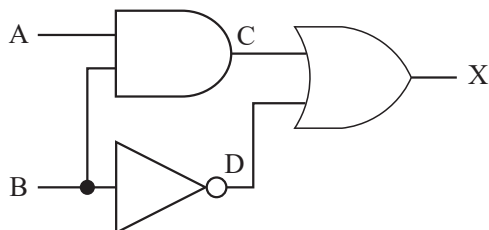
Explanation

- (1) AND Circuit (logical conjunction circuit).

An AND circuit is a circuit that outputs 1 only when all inputs are 1. Therefore, the truth table is as follows.

Input		Output
A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

- (2) Create and analyze the truth table for each circuit.



A	B	C	D	X
0	0	0	1	1
0	1	0	0	0
1	0	0	1	1
1	1	1	0	1

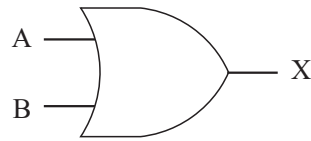
Therefore, the truth table is as follows.

Input		Output
A	B	X
0	0	1
0	1	0
1	0	1
1	1	1

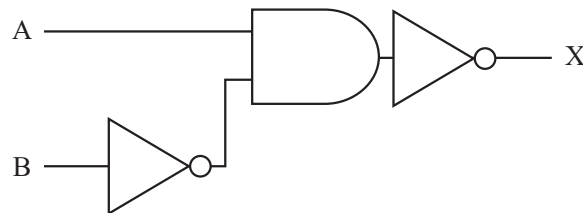
Try

Answer the following questions.

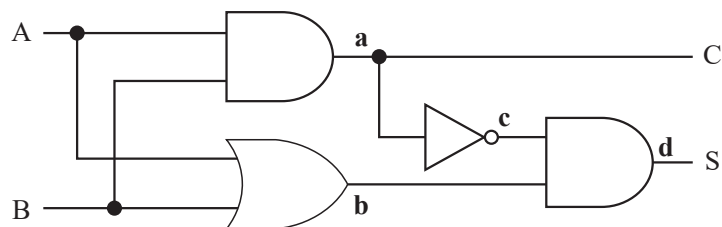
- (1) Name the following logic circuit and create a truth table.



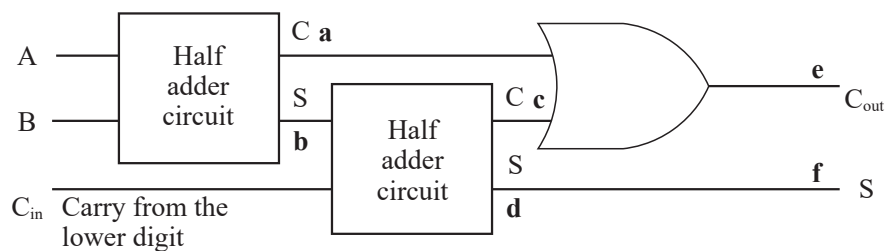
- (2) A circuit was created by combining logic circuits as shown in the following diagram. In this case, create a truth table for inputs A, B, and output X.



- (3) In the following half adder circuit, determine the values of each output **a** to **d** when input A is 0 and input B is 1.



- (4) In the following full adder circuit, determine the values of each output **a** to **f** when input A is 1, input B is 1, and input C_{in} is 0.

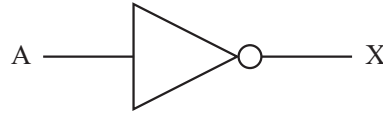


Exercise

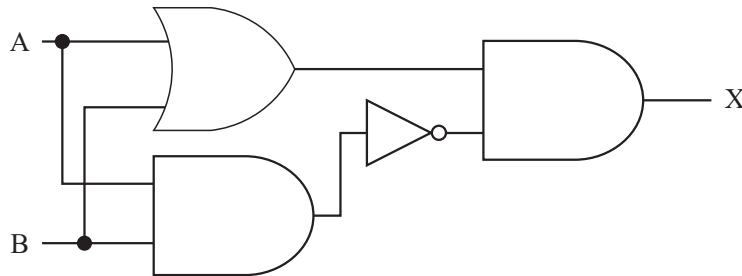
1 Cover the **Point!** section on page 90 with a red sheet and test yourself by writing the items in order in your notebook.

2 Answer the following questions.

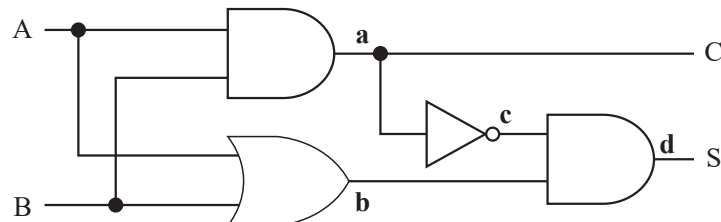
(1) Name the following logic circuit and create a truth table.



(2) A circuit was created by combining logic circuits as shown in the following diagram. In this case, create a truth table for inputs A, B, and output X.



(3) In the following half adder circuit, determine the values of each output **a** to **d** when input A is 1 and input B is 1.



(4) In the following full adder circuit, determine the values of each output **a** to **f** when input A is 1, input B is 0, and input C_{in} is 1.

