

Computing Basics

Objective 1.1: Explain the basics of computing

Computers perform four basic operations on data: They accept *input* from users and devices, *process* data by performing calculations and other operations, *store* data obtained from input and processing, and provide *output* of their results.

In this chapter, you'll learn everything you need to know about Tech+ objective 1.1, including the following topics:

- ▶ **Input**
- ▶ **Processing**
- ▶ **Output**
- ▶ **Storage**

COMPUTER ACTIONS

Any computing device performs four basic operations: obtaining input, storing data, processing data, and providing output. This is true whether you're dealing with a laptop or desktop computer, a server, a smartphone, a tablet, or another specialized computing device.

Input

Input is when we provide information to the device to help us do our work. Input often comes from users, and we provide that input in a variety of ways. If we're using a laptop or desktop computer, we might provide input by typing on the keyboard or moving and clicking the mouse. On a tablet or smartphone, we're used to interacting by tapping or swiping on the screen or by using our voices.

Input doesn't have to come directly from a person. Computers can also receive input from other computers, from stored data, or even from sensors. For example, the thermostat in your home is a computer. It receives input from a built-in thermometer that tells it the current temperature in your home. It also receives input from residents when they change the temperature setting on the thermostat screen.

Processing

Processing is when the computer analyzes data and performs operations on it. For example, if the computer calculates the total amount of a customer order by adding together the prices of individual products and computing taxes and discounts, that's an example of processing.

Computers can also process data in other ways. When a computer manipulates an image file, plays a video file stored on disk, or predicts the weather, all of those actions are examples of processing.

In most computer systems, processing is done by a special chip inside the computer called the *central processing unit (CPU)*. We'll cover CPUs and other ways of processing data in Chapter 6, "Internal Computing Components."

Output

For a computer to be useful to us, it needs some way to provide us with *output*. Output is simply the computer reporting back to us on the results of its processing.

Output can come in many forms. The simplest form of output is simply showing the results of processing data on the screen, where we can read it. We can also use a printer to create a paper record of output.

Output can also come in other forms. Instead of providing us with the output of its calculations for us to read, a computer might use output to provide instructions to another device on how it should perform.

Storage

When a computer receives input, it can do two different things with that input: It can store the data directly or it might perform some processing on that data (discussed in the next section) and then store it.

Storage mechanisms allow computers to maintain data that they will need later. Computers can store data in two different ways. They might keep some data stored in memory, where the computer can quickly access it on a temporary basis, or they might write the data to a hard drive, cloud storage service, or other storage location where it may be kept more permanently.

EXAM TIP

You should be prepared to answer exam questions asking you to read the description of an action and classify it as one of the four basic computing actions. Know the differences between input, storage, processing, and output.

Tying It All Together

Let's tie that all together by returning to the thermostat example from earlier.

Input

A thermostat is a computer that receives input from two different sources. You might provide input to the thermostat by telling it the temperature you'd like to have in your home. You might set your thermostat to 74 degrees Fahrenheit. The thermostat also receives input from its built-in thermometer, telling it the actual temperature in your home, which might be 77 degrees on a warm day.

Processing

The thermostat then performs some processing on that input. Basically, it asks the question, is the current temperature lower than the desired temperature, equal to the desired temperature, or above the desired temperature?

Output

The thermostat provides some output in the form of instructions to other devices. If the current temperature is lower than our desired temperature, that means that your house is too cool and the thermostat tells the furnace to turn on and generate heat. If it's too warm in the house, the thermostat turns on the air conditioning to cool down the temperature.

These four actions—input, processing, storage, and output—are the basic activities carried out by any computing system. For example, think about the computer that you use most often. It likely has the following:

- ▶ Input devices, including a keyboard, mouse/trackpad, microphone, and video camera/webcam
- ▶ Processing capability in its CPU
- ▶ Storage capacity in memory and a hard disk drive (HDD) or solid-state drive (SSD)
- ▶ An output device, such as a display or printer

Storage

The thermostat might store the current temperature in memory so that it can later show you data on the temperature in your house over time.

CERTMIKE EXAM ESSENTIALS

- ▶ Computers receive input from a variety of sources, including directly from users and from other devices.
- ▶ After receiving input, computers may perform processing on that input to perform computation or decision-making. They may then store the original data and/or processed data in memory or on disk.
- ▶ Computers provide output in the form of data displayed to end users on monitors or printers as well as in the form of commands sent to other devices.

Practice Question 1

You are assisting a manager who is trying to print a PDF report saved on their laptop for distribution to their employees at a staff meeting in a few hours. The manager is frustrated because the printer keeps jamming, preventing them from printing the report.

What basic computing action is causing this problem?

- A. Input
 - B. Processing
 - C. Output
 - D. Storage
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Practice Question 2

You are working with a front desk technician at a hotel and troubleshooting an issue that guests are having with the hotel's check-in kiosks. The kiosks use a touchscreen to interact with guests. The touchscreens are correctly displaying information, but when users tap buttons on the screen, the device does not respond.

What basic computing action is causing this problem?

- A. Input
 - B. Processing
 - C. Output
 - D. Storage
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Practice Question 1 Explanation

This question asks us to evaluate the situation and decide whether it involves input, processing, output, or storage. Let's walk through each of the possibilities.

Input is when a user or system provides data to a computer. In this case, we don't need to gather any new data. The information the manager wants is already present in a PDF report.

Processing is when the computer performs computation or analysis on data. Again, we already have a PDF report that would contain the results of that analysis, so processing seems to be working fine.

Storage is when the computer saves data for later use. Once again, the report is already generated and saved on the device, so there is no storage issue.

The core issue here is that the printer is not creating the report. That's an output issue because the printer is an output device. The manager can't generate the report to provide to their team.

Correct Answer: C. Output

Practice Question 2 Explanation

This question also calls for the classification of this activity into one of the categories of input, processing, output, and storage. Let's walk through each of the categories.

The use of a touchscreen makes this a very interesting question because touchscreens are both input *and* output devices. They accept input from users in the form of touches, and they provide output on the screen. With this knowledge that touchscreens perform input and output, we can quickly eliminate processing and storage as possible answers.

We don't seem to have an output problem here because the touchscreens are correctly displaying information. We do have an input problem because the devices are not responding when users attempt to input information by tapping buttons on the screen.

Correct Answer: A. Input
