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Notes: Chapter 3: Computer Basics

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 outputs of their results.

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 various ways. For example, if we're using a laptop or desktop computer, we 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 you the current temperature in your home. It also receives input from residents when they change the temperature setting on the thermostat screen.

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.

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. Com-puters 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.

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.

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 exam-ples of 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

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 the output to provide instructions to another device on how it should perform.

The thermostat provides some output in the form of instructions to other devices. If the current temperature is lower than your 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 car-ried 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
- Processing capability in its CPU
- Storage capacity in memory and a hard disk drive (HOD) or solid-state drive (SSD)
- An output device, such as a display or printer

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

Explanation Question 1

This question asks us to evaluate the situation and decide whether it involves input, processing, storage, or output. 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 of 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

Explanation Question 2

This question also calls for classifying this activity into one of the categories of input, processing, output, and storage. Once again, 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 provide output on the screen. With this knowledge that touchscreens perform input and output, we can quickly elimi-nate processing and storage as possible answers.

We don't seem to have an output problem here because the touchscreens are correctly displaying information. However, 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

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Beyond the Book

Computers are everywhere, whether recognized in the form of phones, PCs, or gaming, to being embedded into our everyday objects and appliances. Few people understand computers and their basic concepts. That is because, most of the time, we are consumers of computers rather than (technical) innovators. My goal is to lay out the fundamental principles of computers in an understandable way. Anyone with just a little curiosity will be able to learn and understand these computer concepts.

What is a computer?

It is an electronic device that can be programmed to carry out a set of logical instructions. If you give me that answer, I will accept it. But I want you to also remember that in an even simpler way to describe it, it is to remember the four functions of the computer: input, processing, output, and storage of information.

Analog & Digital – Understanding the difference between analog and digital is important in understanding the workings of a computer. If I were reading the needle on a weight scale, that needle would indicate the weight of that item. It is not the actual weight; it is an analogy of the weight. We understand an analogy of something through the weight of the needle. This is called an analog approach. This is just as the mercury in the glass indicates the temperature. It is also the same for a phonograph. The modified grooves in the record are an analog representation of the recorded sound. The shape of the grooves corresponds to the sound waves that are created. We can go even further by speaking about photography and video. Both are representations that are analogous to events that happened in the past.

It is difficult for computers to replicate such a diverse amount of data. The technology for reading temperature, reproducing sound through grooves, and printing photographs all require a diverse group of tools and instruments. Additionally, analog data can degrade over time through physical ware and for every additional generation as copied.

Going digital gets rid of those problems listed above. A digital system represents data as a sequence of symbols, each representing one of a limited set of values. With computers, values are listed as 1s and 0s. It could be based on more, but that increase would cause unnecessary complexity to the system. Everything on your computer is stored in 1s and 0s. Pictures, songs, and documents are stored on your phones and computers in 1s and 0s. How can it be that we can represent anything with such a limited language? Remember that this system works with *sequences* of 1s and 0s. The 1s and 0s are stored magnetically on tape, on flash drives, it is stored as electric charges. Letters of the alphabet, both lower and upper case, are expressed in 8 bits (one byte) for a combination of over 256 unique combinations, more than enough to cover almost all characters in the English language. You can make characters represent anything you want as long as the software knows your scheme. The process of translating data into digital format is called *encoding*. When interpreting digital data, it is called decoding.

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Assignment: Tech PowerPoint Topic

For your upcoming presentation, each of you will select a technology topic to research and present to the class. Your presentation must include at least **5 slides** and cover key aspects of the technology you choose. You will need to explain **what the technology is, its historical background, its impact on society, current uses or advancements**, and **its potential future implications**. The goal is to help your classmates understand the importance and relevance of this technology in both the past and present, as well as what we might expect from it in the future. Be sure to use visuals, data, and examples to make your presentation engaging and informative.

Here are 20 compelling technology topics for presentations:

1. **The Evolution of Fire as Technology**: How humanity's control over fire changed civilizations.
2. **The Invention and Impact of the Wheel**: Examining how one of the earliest technologies revolutionized transportation and society.
3. **Printing Press: The Birth of Mass Communication**: Exploring how Gutenberg's invention transformed knowledge sharing.
4. **Steam Engines and the Industrial Revolution**: How steam power reshaped industries and economies globally.
5. **The Rise of Electricity: Powering the Modern World**: From early discoveries to widespread electrification and its societal impact.
6. **Telegraph and Telephone: The Dawn of Modern Communication**: Tracing the journey from Morse code to modern telecommunications.
7. **The Internet: A Global Communication Revolution**: How the Internet has transformed commerce, communication, and culture.
8. **Artificial Intelligence: The Future of Thinking Machines**: An exploration of AI, its history, and its implications for the future.
9. **Blockchain and Cryptocurrency: Redefining Finance**: Understanding blockchain technology and how cryptocurrencies are disrupting traditional banking systems.
10. **Virtual Reality: Immersive Technology in Gaming and Beyond**: Exploring the growth and future of VR across industries.
11. **Biotechnology: The Fusion of Biology and Technology**: The advances in genetic engineering, biohacking, and medicine.
12. **Smart Homes and IoT (Internet of Things)**: How interconnected devices are creating smart environments and their implications for privacy.
13. **Quantum Computing: The Next Frontier in Processing Power**: Exploring the potential of quantum computing and its future impact.
14. **Cybersecurity in a Digital World**: Understanding the importance of protecting information in an increasingly connected world.
15. **Renewable Energy Technologies: Solar, Wind, and Beyond**: How technology is helping to address climate change and energy needs.
16. **Autonomous Vehicles: The Future of Transportation**: The development and challenges of self-driving cars.
17. **3D Printing: Revolutionizing Manufacturing and Medicine**: Exploring the transformative impact of 3D printing across industries.

18. **The Role of Drones in Modern Technology**: From military use to commercial applications, drones are transforming industries.
19. **Wearable Technology: Fitness Trackers, Smartwatches, and Beyond**: How wearable devices are changing healthcare and personal data monitoring.
20. **Space Exploration Technology: From Satellites to Mars Missions**: Examining the advances in space technology and the future of space exploration.

These topics will not only engage your students but also provide them with a broad understanding of how technology impacts different aspects of life and society.

Here are five basic questions that you should answer:

1. **What is the technology, and how does it work?** – Provide a clear explanation of the technology, its purpose, and how it functions.
2. **What is the historical background or origin of this technology?** – Explore the origins of the technology, its development over time, and key milestones.
3. **What are the major impacts of this technology on society?** – Discuss how the technology has influenced society, culture, or specific industries.
4. **What are the current advancements or applications of this technology?** – Explain the latest developments and how this technology is being used today.
5. **What are the potential future implications or challenges related to this technology?** – Consider what the future holds for this technology, including possible benefits, risks, or ethical considerations.

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Computer Basics – input/output devices

1. **What are the four basic actions that a computer performs on data?**
    - Answer: Input, Processing, Storage, and Output.
2. **Describe one example of how input can come from a device rather than a user.**
    - Answer: A thermostat receives input from its built-in thermometer, which measures the current temperature.
3. **What is the difference between storing data in memory versus on a hard drive or cloud storage?**
    - Answer: Data stored in memory is accessible quickly but temporary, while data stored on a hard drive or cloud storage is more permanent and can be accessed later.
4. **In what scenario would a computer process data instead of storing it immediately?**
    - Answer: When a computer calculates the total cost of a customer order, it processes the prices of individual items to generate a final total before storing it.
5. **How does a thermostat provide output?**
    - Answer: It provides output by sending instructions to the heating or cooling system to adjust the temperature based on the current and desired temperatures.
6. **What would be considered an input device on a computer? Give two examples.**
    - Answer: Input devices include keyboards and touchscreens.
7. **Why is a CPU important for processing in a computer?**
    - Answer: The CPU performs calculations and operations on the data received, enabling the computer to function effectively.
8. **What are two types of output that a computer might provide?**
    - Answer: Output can be displayed on a screen or printed on paper by a printer.
9. **What computing action would be involved if a computer saved a file for later use?**
    - Answer: Storage.
10. **Why would a touchscreen not responding to touches be considered an input issue rather than an output issue?**

- Answer: Because the screen is correctly displaying information (output), but the problem lies in the device not accepting or recognizing the input (touches).