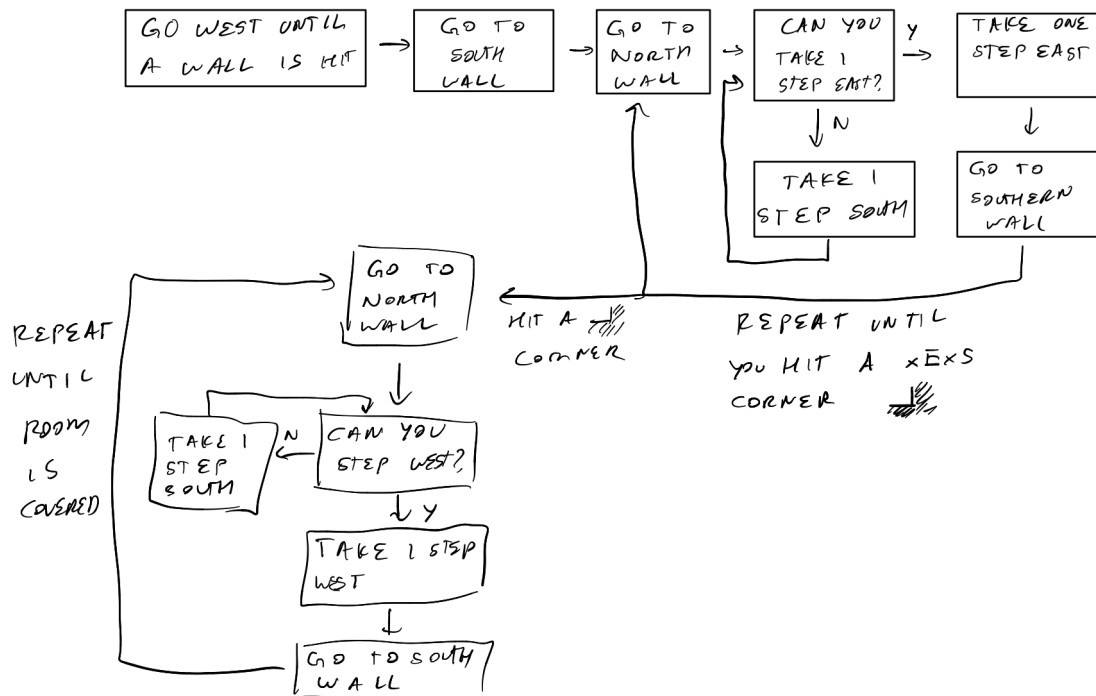


Written Responses

Question 1: Pseudocode



Question 2: Computer History¹

Admiral Grace Hopper was a mathematician who is commonly recognized as one of the first programmers. She made significant contributions to research in the field of computer languages (her work was even the basis for COBOL). After getting her degrees, the US went into World War 2, and she attempted to enlist but was rejected. She was persistent enough that she was granted a position working with the Mark I computer at Harvard University, working for the Navy. She used large room-sized computers in order to make pressing calculations: rocket trajectories, range tables for guns, and calibrations in order to assist the navy. After the war, she remained at Harvard and helped develop the Mark II and Mark III computers. It was during her work on the Mark II that she and her colleagues discovered the first computer "bug": an actual insect stuck in the machinery causing it to malfunction, and was the first to "debug" a computer. Later, she worked on the UNIVAC I, and helped develop the first compiler: A-0 which would take code, and translate it into a format that the machine could understand making the process of programming more general (rather than having to write a program for a specific machine). Even modern languages such as Fortran and C++ rely on the compilation process to run programs. Later she and her team developed Flow-Matic, a language which departed from programming norms of the time and used english-like commands. She later went on to be one of the biggest driving forces between the development and adoption of COBOL in the computing world. Admiral Hopper pioneered the idea of generalized programming, and helped shape the path for the development of many modern programming languages.

Question 3: How Computers Work

- GPU/Video Card²:

¹<https://news.yale.edu/2017/02/10/grace-murray-hopper-1906-1992-legacy-innovation-and-service>

²<https://computer.howstuffworks.com/graphics-card.htm>

- **How does this component work?**

The GPU takes input information about images to be displayed to the screen, and then performs the relevant calculations necessary to figure out how to display the image using the pixels of the monitor. GPUs are more dedicated to rendering-related calculations (which are a lot more intensive than simple screen manipulations). Graphics units need to be extremely fast, so they generally use more parallel structures so multiple operations can happen at once. Some GPUs are found integrated into the central CPU module itself, other GPUs have their own chips and dedicated cooling systems (typically in higher-power systems).

- **Why is it important?**

Nowadays just about all consumer computing devices have a GUI for interaction. Without a video card, it would be impossible for us to see stuff on the computer itself. Even back in the day, when pretty GUIs weren't a thing, a video card was still necessary to display simple green text on the black background of a terminal. Without a graphics card, there's no visual feedback for the user. No word processors where you can see what you're writing, no zoom calls, no video games, no Youtube. Without the ability to see graphics, none of these applications would be very useful.

- Keyboard³:

- **How does this component work?**

A keyboard consists of an array of buttons/switches which when pressed, close a circuit and send a signal to the computer telling it what character to display. The computer then checks the location of the closed circuit against a character map in its memory to determine what specific character is to be displayed. The benefit of such a method is that the keyboard is not statically restricted to only displaying the characters written on the physical keyboard, but can be remapped to different languages or input systems.

- **How does this component work?**

The keyboard is important because it's the primary method of providing input to a computer. Solely relying on a mouse to do work would be next to impossible, there's no way to efficiently provide text input! Additionally, standardizing the layout of the keyboard ensures that people don't have to relearn the input layout every time they access a different machine. The keyboard was the primary method for interacting with a computer, long before GUIs and point-and-click features became a thing.

³<https://computer.howstuffworks.com/keyboard2.htm>