Graded Exercise 0

CSC131 The Beauty & Joy of Computing

31 August 2018

1. Psychologists have found that quizzes help students learn. If you are learning on your own (outside of a class and without the help of a teacher), how might you use this knowledge?

When you do not have a teacher (and even when you do), you can write your own questions. You could put a question on one side of a card and the answer to the same question on the back side of the card. You could quiz yourself with a set of such flashcards.

2. Look in Chapter 2 of *How We Learn* for the story about Phillip Boswood Ballard. His experiment involved a poem that Henry Wadsworth Longfellow had written and children in London. What did he discover?

Ballard discovered that the children could remember more of the poem a few days after first encountering it than they could immediately after the first reading. This was so even though the children made no further study of the poem between the time of the first test of their recall and the subsequent test.

This story appears in the book right after a discussion of "forgetting curves." A forgetting curve describes how quickly memory fades over time. Ballard's experiment showed that recall of a poem or other meaningful text (but not random words or numbers) might increase before declining.

3. Benedict Carey compares the memories of computers and people on the last page of Chapter 1 of *How We Learn*. What lesson does he share there?

Our brains combine old memories with new memories and mix memories of different experiences. Because of this, what a person recalls of an event might change over time. Human memories, unlike computer memories, do not reliably produce the same perfect and unchanged data each time they are exercised.

4. Jack Kilby and Robert Noyce invented the integrated circuit. A few years later, Gordon Moore predicted a rapid rate of progress for this technology.
   (a) What is an integrated circuit?
   (b) How fast has industry succeeded in improving integrated circuits?

(a) An integrated circuit is a "computer chip." Computer engineers can build complex electronic circuits on a single piece of a semiconductor material like silicon.

They have not only found ways of packing many (millions and even billions) individual transistors and other components on a small surface, they have also highly automated the manufacture of integrated circuits. In these ways, computer engineers have greatly reduced the cost of electronic devices. They have made these devices much smaller. They have made them more reliable and durable. They have given us devices that can store more data, sense the world more accurately, communicate more reliably, and compute more rapidly. Integrated circuits are now ubiquitous, found in computers, telephones, cameras, televisions, automobiles, airplanes, satellites, household appliances, machines in factories, and so on.

(b) Gordon Moore predicted that industry would succeed in packing twice as many transistors on integrated circuits every year. He later reduced the rate of doubling from every year to every two years. Although people often misuse the word "exponential," in this case the rate of progress that Moore correctly predicted more than fifty years ago was is really exponential.

5. HTML and LaTeX give authors a means to separately specify the...

   - content of a document—the words and images a reader will see
   - organization of the document—its division into sections and the assignment of special significance to words that make up, for example, titles, captions, and elements of tables and lists
   - format of a document—its appearance, including typefaces and fonts, margins, and colors

   This is an application of the principle of "separation of concerns."

   Read the Wikipedia article on the Separation of Concerns.

   (a) We are applying the principle in the creation of a book. What are some other undertakings in which the principle might find application?

   (b) How might the application of this principle help us in our work?

   (a) Urban planners, architects, and software engineers apply this principle in their work.

   (b) It allows us to focus on one part of our work at a time. In collaborative projects, it allows different members of a team to specialize. For example, one person might be a good graphic artist and another might be a good writer.

6. The commands in Linux are given in short sequence of characters (for example, ls, cd, and cp). The commands in Emacs are also given in short sequences of characters (for example, C-X C-S, C-X C-C, C-K, C-Y, C-A, and C-E).

   These commands are not obvious!

   Why did the authors of Linux and Emacs give us these kinds of commands?

Computer scientists created Linux and Emacs for other computer scientists. Their intended audience was made up of people who use computers every day and who are willing to take the time to learn abbreviated commands if those commands, once learned, let them work more quickly. Short abbreviations might be harded to learn and use than a menu that describes commands with complete words, but trained persons can more quickly type a few keystrokes than they can type whole words or select from a menu.

The authors of this software gave priority not to making an easy-to-learn product but to creating a product that would enable users to work efficiently.

7. Find a reference or tutorial for Emacs on the Web. How can you cut and paste a paragraph?

- move to the start of the paragraph that is to be cut
- C-SPC (hold the control key and the space bar simultaneously)
- move to the end of the paragraph
- C-w (hold the control key and the "w" key simultaneously)
- move to place in the document where the paragraph is to be pasted
- C-y (hold the control key and the "y" key simultaneously)

8. You will be more productive in Emacs if you learn commands for moving about within a document.
   (a) What is an Emacs command for moving to the top of a document?
   (b) What is an Emacs command for moving to the end of a line?

- ESC < (press the escape key and then the "<" key)
- C-e (hold the control key and the "e" key simultaneously)

9. Markup languages give special meanings to some characters. These characters denote commands to the software that formats the document. An author who wants to make one of these characters visible to readers must somehow indicate that the formatting software should not interpret the character as a command.

   For example, in LaTeX the ampersand (&) is a special character. To make it visible to readers, an author must precede it with a backslash.

   Identify two other characters that also have special meaning in LaTeX.

   Any two characters from this set make a good answer to this question:

   & % $ # _ { } ~ ^ \

10. We will use a text editor, typesetting software, the Linux operating system, software that allows us to connect to a remote computer and to move documents between computers, and software that will track changes in our documents.

    How might you use some of the methods of learning that you are encountering in your reading to gain facility with these tools?

    Instead of trying to learn everything you think you might to know about Emacs before beginning your study of Linux, mix study of the one subject with study of the other. Learn a little Emacs, then a little Linux, and then back again to Emacs. This is "interleaving."

    Instead of studying a subject once for (let's say) four hours, schedule two or three shorter sessions. You may find that your study is more productive if you allow some signficant amount of time to pass between sessions. This is "spaced repetition."

    Instead of relying on a teacher to require you to recall what you have learned, test yourself as you go. Write your own questions and answers.

    Write questions for yourself when you do not yet know the answers. Try solving problems with what you already know. Reflect on what you are learning. Put ideas in your own words. Summarize. Comment on how

easy or difficult a passage is. Write a note to yourself about how understandability or persuasiveness of a passage.