Exercise 9 for Students of Computer Science

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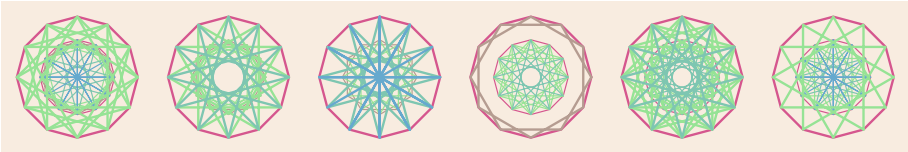

An Introduction to the Study of Programming Languages

1. Read a little online about the life of Donald Knuth.
   - Share with us some interesting detail of Donald Knuth's life before he became a professor.
   - Donald Knuth has interests outside of computer science. Name one of these other interests.
   - What prompted Donald Knuth to begin writing *The Art of Computer Programming*?
   - What is *literate programming*?
   - What prompted Donald Knuth to create TEX?
   - (BONUS Question) What is Donald Knuth's Chinese name?
2. Find *The GNU C Reference Manual* online. Look at the last sentence in the credit section. Search on the Web—at which college did Trevis Rothwell study?

Donald Knuth famously paid people who found errors in his books. Recipients hold his checks with great pride.

Trevis Rothwell got one of these checks from Donald Knuth.

3. Order these programming languages chronologically:

   - Ada
   - AWK
   - BASIC
   - C
   - C++
   - C#
   - COBOL
   - FORTRAN
   - Java
   - JavaScript
   - Lisp
   - Pascal
   - Perl
   - Python
   - Ruby
   - Scheme

4. From where did Python get its name?

5. Ada and Pascal are the names of people. The name of the AWK programming language is a word formed from the first letters of the names of three people.

   - Which three people?
   - There is a word with a different spelling but the same pronounciation. What is an auk?

6. How are Java and JavaScript related? (This is a bit of a trick question!)

7. Find the personal website of Douglas Crockford.

   - Look at his career. What do you think?
   - What was the title of his 2008 book with O'Reilly Media? Does that title tell you anything?

8. The name of Perl is a "backronym." That is a kind of acronym. Explain.

9. Yukihiro Matsumoto, the creator of the Ruby programming language, was thinking of Perl when he named his language. What's the connection between the names of the two languages?

10. Computer scientists developed some programming languages for use in education. Can you name such a language?

11. The development of the Internet and the World Wide Web spurred the evolution of programming languages. Can you name a language that find wide use in applications for the Web?

12. Computer scientists adopted Lisp as a tool especially for what kind of research?

13. For many decades, COBOL and FORTRAN were two of the most popular programming languages. Scientists and engineers favored FORTRAN. Programmers in business favored COBOL. The problems that arise in a bank, an insurance company, or a human resources department differ from those that arise in a laboratory or factory.

    Can you discover some distinctive feature of one of these languages that made it better suited for its problem domain?

14. We heard Brian Kernighan say a little about how the architecture of Digital Equipment Corporation's (DEC's) PDP-11 computer influenced the design of the C programming language. The PDP-11 had instructions for arithmetic on both bytes and 16-bit words. The C language, designed for use in writing an operating system on computers like the PDP-11, has datatypes (e.g., **char**, **int**) that correspond whose size matches that of the operands of the machine instructions.

    This has been a two-way street.

    Innovations in hardware have influenced developments in programming languages. Innovations in programming languages have also influenced developments in hardware.

    For example, improved compilers made RISC architectures more attractive.

    What is RISC?

15. Find a list of JVM languages. What is a JVM language? Which of the languages are already familiar to you?

16. You will find authors who describe Java as a hybrid language. However, not all authors are using the word *hybrid* to mean the same. Can you find two distinct meanings of this word?

17. Compare Java's primitive types to Kotlin's basic types. Any differences? (Be careful!)

18. Write a line of Kotlin code that declares an integer variable, assigns an initial value to that variable, explicitly identifies the type of the variable, and ensures that subsequent statements will not change the value.

19. Programming languages give us:

    - arithmetic operators
    - logical operators
    - relational operators

    How do the relational operators of Kotlin compare to those of Java?

20. How can a Kotlin programming produce an integer value from a floating point value?