

This exercise explores some of the points made in Ken Thompson's 1984 Turing Award lecture.¹

1. List the members of your group below:

2. The seven figures in Thompson's paper (Figures 1, **2.2**, **2.1**, 2.3, 3.1, 3.2, and 3.3) suggest seven C programs (say, P1, P2.2, P2.1, P2.3, P3.1, P3.2, and P3.3). Indicate which of these programs (if any) will **not** compile successfully using a standard C compiler (such as gcc) and explain your answer briefly.

3. The parenthetical remark in the last paragraph on page 761 of Thompson's paper suggests that output of the program in Figure 1 in that paper differs from the program's listing in Figure 1. Explain this difference as precisely as you can. (Assume that the text "(213 lines deleted)" has been replaced by the appropriate text suggested by the comment in the listing, and ignore the explanatory material following the last closing brace.) Hint: There are differences other than white-space differences.

¹Ken Thompson, "Reflections on Trusting Trust," *Communications of the ACM* 27/8 (1984).

4. Suppose file `c1.c` contains the complete source code of a typical C compiler, as suggested by Figure 2.2 in Thompson's paper.² Suppose `c2.c` is a modified version of `c1.c` in which the special character code `\v` is implemented as suggested by Figure 2.1. Similarly, suppose file `c3.c` contains a modified version of `c1.c` in which the character code `\v` is implemented as suggested by Figure 2.3.

Let $E(c, p)$ be the result (executable code) of compiling file p (source code) with compiler c (executable code). If compiler c generates a compile-time error on input p then $E(c, p)$ is undefined.

Assume that an executable $c1 = E(c1, c1.c)$ is initially available.

For each of the following compilations, indicate whether there is any error, *explaining each answer briefly*.

- (a) $E(c1, c2.c)$
- (b) $E(c1, c3.c)$
- (c) $E(E(c1, c2.c), c1.c)$
- (d) $E(E(c1, c2.c), c2.c)$
- (e) $E(E(c1, c2.c), c3.c)$
- (f) $E(E(c1, c3.c), c1.c)$
- (g) $E(E(c1, c3.c), c2.c)$
- (h) $E(E(c1, c3.c), c3.c)$
- (i) $E(E(E(c1, c3.c), c2.c), c2.c)$
- (j) $E(E(E(E(c1, c3.c), c2.c), c2.c), c3.c)$

²*Idem*, Figures 2.1 and 2.2 appear out of order in the paper.

[additional space for answering the earlier question]

5. Ask each member of your group to describe his or her Capstone project very briefly (in one minute). Then have each group member write down three significant positive comments and three significant negative comments about someone else's project. (Be frank but fair.) Then have each member respond to these comments briefly.