

1. Consider a machine with no branch predictors (*i.e.*, the hardware does not use past behavior to tell whether a branch will be taken or not taken). Instead, the machine's ISA allows a compiler to set a flag on each branch indicating if the branch is usually taken or usually not taken. Which kind of compiler would you expect to perform better for this machine: a static compiler (like gcc)? Or a just-in-time compiler? Explain.
2. Using the production rules of MICRO, give a derivation of the program: `BEGIN id := id - id; READ(id); END`. Is this the only possible derivation?
3. Describe a scenario where writing code directly in assembly might be preferable to using a compiler. Describe a scenario when the opposite is true.
4. Give a regular expression that matches valid email addresses. A valid email address, for the purposes of this problem, consists of a string of alphanumeric characters, followed by an "@" sign, followed by a domain name that is a string of alphanumeric characters followed by ".com" or ".edu" Subdomains are allowed. For example, the following are valid email addresses:

milind@purdue.edu, bob@bob.foo.com

and the following are not:

bob@bob.net, @bar@foo.com