Compiler Construction

Explain a possible implementation method for Java-style or ML-style exceptions and handlers. [8 marks]

Consider a simple arithmetic expression $e$ of abstract syntax:

$$e ::= x | n | e + e' | e - e' | e * e' | e/e' | -e$$

where $x$ ranges over a set of (global) variables, addressable by name, and $n$ ranges over integer constants. Write a procedure in pseudo-code or a language of your choice which takes an expression $e$ and prints (one-per-line) stack-machine instructions of the form

- pushvar $x$
- pushnum $n$
- add ; pop two items and push their sum
- sub ; pop two items and push their difference
- mul ; pop two items and push their product
- div ; pop two items and push their quotient
- neg ; replace top item with its negation

which, when executed, have the net effect of pushing just the value of $e$ onto the stack. Each line of code emitted should contain a comment giving the number of items on the stack after its execution, thus the first push and the last instruction would both be commented with “1 item”. [12 marks]