Exercise 4: Address Assignment in Variable Declarations

Consider the following context-free grammar for variable declarations:

```
VarDeclList = VarDecl {VarDecl}.
VarDecl     = Type ident {"," ident} ";".
Type        = "boolean" | "char" | "int".
```

Turn it into an attributed grammar that prints the address of each variable and, finally, the total amount of memory required for all variables. Variables of type boolean require 1 byte, of type char 2 bytes, and of type int 4 bytes. For the declarations

```
boolean x, y;
int b;
char c;
```

the output should look as follows:

```
x: 0
y: 1
b: 2
c: 6
Total = 8 bytes
```

Solution

```
VarDeclList                  (. int adr = 0; .)
= VarDecl <↓adr, ↑adr>
  {  VarDecl <↓adr, ↑adr>
  }                          (. System.out.println("Total = " + adr + " bytes"); .) .

VarDecl <↓adr, ↑adr>         (. int adr, size; String name; .)
= Type <↑size>
  ident <↑name>              (. System.out.println(name + ":  " + adr); adr += size; .)
  {  ident <↑name>           (. System.out.println(name + ":  " + adr); adr += size; .)
  }
  ";" .

Type <↑size>                 (. int size; .)
= "boolean"                  (. size = 1; .)
|  "char"                    (. size = 2; .)
|   "int"                    (. size = 4; .) .
```