Reading: For Friday, also read Sebesta Chapter 10, except section 10.6 on implementing dynamic scoping. This is a short chapter, and actually fits hand-in-hand with the chapter 5 material. For next week, read the “Stack Language” handout and begin reading Chapter 6.

(1) For Friday 5pm, you must submit online a working C# translation Dispatching.cs of Dispatching.java. You should compile it both without virtual and override used on the Foo method in class Base and the version in class Derived that can override it, and with them. You should submit the version in which override is present. (Both versions must have override applied to the ToString() methods, since they are already virtual in the C# library.) This is worth 45 pts. The report questions, worth 45 pts. and now due in hardcopy only on Wed. 10/3, are still TBA (sorry!), but will follow the outline given before.

(2) Diagram the four storage objects p, q, x, and y declared in the following C program, and show the changes to them during its execution. Use 2310,2312 as the binding addresses of the pointers p and q, and 3418,3420 for the binding addresses of the integers x and y, respectively. Give the final values of all four storage objects, not just y, and show your work clearly. (18 pts.)

```c
#include "stdio.h"
void main() {
    int x, y, *p, **q;
    x = 5;
y = x+3;
p = &x;
q = &p;
(**q) = y + x;
(*q) = &y;
(**q) = y - x;
printf("Final value of y is \%d\n",y);
}
```

(3) Consider the Ada program at left, or if you prefer, consider the C program at right, which is completely equivalent for this question.\(^1\)

```ada
with Ada.integer_text_io; use Ada.integer_text_io;
with text_io; use text_io; #include <stdio.h>
procedure G is /*Global variables*/
x: integer := 2;
int x = 2;
z: integer := 4;
int z = 4;

function A(y: integer) return integer is
    int A(int y)
    x: integer := 10;
    int x = 10;
begin
    return x + y + z;
    return x + y + z;
end A;
```

\(^1\)Nowadays, not saying int main() in C gives a warning, but let’s ignore that.
function B(y,z: integer) return integer is
begin
    x := 8;
    return A(x + y + z);
end B;

procedure M is
begin
    y: integer := 1;
    z: integer := 3;
    put("B(x+y,z) = "); put(B(x+y,z));
    put(" and x = "); put(x); new_line;
end M;
begin --of G
    M;
end G;

(a) There are three referencing environments in which the identifiers x, y, and z occur in expressions, namely A, B, and M (or "main" in the C code). Those three blocks are nested inside the outer block G (which corresponds to "global file scope" in the C code). For each of the 9 occurrences of x, y, and z, say which block has the declaration that binds that occurrence.² (9 pts. total)

(b) Trace the execution of the program, showing the sequence of stack frames and activities including assignments going on inside them. What final values of B(x+y,z) and x are printed? (18 pts., for 27 on the problem and 90 on the set, including the 45 pts. for the Assignment 4 report.)

²For instance, if w were declared in G and in A, and occurred in A and M, then the occurrence in A would be called "A.w" as our answer, while that in M would be "G.w." You should have 9 such answers, preferably in a 3 × 3 grid with rows labeled A, B, M and columns labeled x, y, z.