**CSCI 360 5. Sections of an Assembler Program**

* **The CSECT statement**
  + Format 1: label CSECT
  + Format 2: label CSECT , comment
  + defines the beginning of a Control SECTion (equivalent to a function, subroutine, or a procedure)
* **The END statement**
  + Format: END label
  + Defines the end of what should be assembled.
  + Last line of an assembler program.
  + label is usually label on the main or 1st CSECT. If specified, then the CSECT named label is the entry point of the program.
* **Last line of EXECUTABLE code**
  + BCR B’1111’,14 or BR 14 (using the extended mnemonic version)
  + returns control back to the operating system

**Linkage Conventions:**

1. On entry to an assembler program, R15 contains the address of the entry point (ie. the beginning of the program). R15 may be used as a base register.
2. On entry to an assembler program, R14 contains the **return address**, which is an address in the operating system to branch to when the program is finished.

**A Sample ASSEMBLER Program:**

Address Code to execute

000000 EXMPL1 CSECT

000000 L 5,24(,15)

000004 A 5,28(,15)

000008 ST 5,36(,15)

00000C L 4,32(,15)

000010 SR 4,5

000012 ST 4,40(,15)

000016 BCR B’1111’,14

000018 NUM1 DC F’15’

00001C NUM2 DC F’7’

000020 NUM3 DC F’8’

000024 RESULT1 DS F

000028 RESULT2 DS F

END EXMPL1

Wouldn’t it have been nice to be able to use the labels NUM1, NUM2, etc...?

**Implicit Addressing**

* **Implicit address** – an address that the assembler will be required to convert to an explicit address
* Use a label (usually on a DC or DS in storage) rather than a D(B) or D(X,B) address when coding an instruction
* Format 1: label
* Format 2: label+n -- where n is a decimal displacement
* Format 3: label(R) -- where R is the # of the index register
* Format 4: label+n(R) -- where n is decimal displacement, R is index reg
* Must first establish addressibility (supply the assembler with the base address) with the USING statement.
  + Format: USING label,R
  + **R** – register # that contains a valid base address
  + **label** – label in the program that corresponds to base address in R
  + USING does not take up any space.

**The Revised Sample ASSEMBLER Program:**

Address Code to execute

000000 EXMPL1 CSECT

000000 USING EXMPL1,15

000000 L 5,NUM1

000004 A 5,NUM2

000008 ST 5,RESULT1

00000C L 4,NUM3

000010 SR 4,5

000012 ST 4,RESULT2

000016 BCR B’1111’,14

000018 NUM1 DC F’15’

00001C NUM2 DC F’7’

000020 NUM3 DC F’8’

000024 RESULT1 DS F

000028 RESULT2 DS F

END EXMPL1