Homework 3 - CECS 424
Taina Coleman
012535859

1. The result for (11 rem 2) is 1, while the result for (12 mod 2) is 5.
The mod function counts the number of times a number goes in a loop, while the rem function shows after a division how many left overs you have. In my opinion it makes sense to provide both since they refer to different numbers in a division. In Pascal the mod function has the same function as % in C, and rem in ADA, being the remainder of a division. I believe the designers could have gotten into an agreement and given an universal semantics to mod and %.

2. A strongly typed programming language has the data types predefined as part of the language and constants and variables defined on a program, which causes those languages to be very strict to the programmer. Static typed languages have the data types defined at compile time, so in some languages the programmer has to specify the type and in others there is a type inference that deduces the type of the variable.
In C you can freely cast any pointer type to another pointer type, or you can create a C union of any two different types.

3. Type conversion and type coercion are ways to change one data type to another. Type conversion can happen implicitly (coercion) or explicitly. Coercion is usually used to describe data changed implicitly, for example, if you try to add an integer and floating point (12.0 + 3), most compilers would transform the integer to a floating point so fractions are not missed. Explicitly type conversion is when addition code is required (type identifiers, type change routines). Non-converting type is always explicit and does not change the underlying bits, but sees them differently, for example, "see this next for bytes as one int32".

4. Overloading is getting different outputs according to the arguments passed to a subroutine, and those types are known on compile time. Generics is getting different outputs to the different types, and those types are not know on compile time, e.g. list of different kinds of objects. The term ad hoc is used to show that this type of polymorphism is not a fundamental feature.

5.

Contiguous	Row-pointer
Direct and easy access	Faster code
Number of disk required is reduced to a minimum	Different row lengths, no need for holes
Good performance is a positive factor	Allows arrays to be constructed from preexisting data without copying it

6. A dangling reference is a live pointer to a no longer existent element. The disadvantages are that the memory used by the data is not returned to the system, not being able to be used again, and it may write on memory that is part of other objects or even modify bits that are part of the implementation's bookkeeping, corrupting the stack or heap.

7.
s:2*10 = 20
c:1*10 = 10
t: 2*10 = 20
d:1*10 = 10
r: 8*10 = 80
l: 4*10 = 40

8. C uses row-major system:
Address of A [I][J] = B + W * [N * (I – Lr) + (J – Lc)]
A[3][7] = 1000 + (4+1)*[10*(3-0) + (7-0)] = 185000

Where:

B = Base address
I = Row subscript of element whose address is to be found
J = Column subscript of element whose address is to be found
W = Storage Size of one element stored in the array (in byte)
Lr = Lower limit of row/start row index of matrix, if not given assume 0 (zero)
Lc = Lower limit of column/start column index of matrix, if not given assume 0 (zero)
M = Number of row of the given matrix
N = Number of column of the given matrix