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CS 311 Homework 1

Starting from the beginning of main in the C++ program the first feature of C++ used which is not available to C, is the use of the string class. This class is useful for obtaining input from the console because it can be of variable size. In C, an array of chars of a predefined size is created and passed to a standard library C function such as fgets which reads input from the user and places it into the array of chars.

The next major feature encountered in the C++ program which is not available in C is the use of std::vector<>(); The equivalent in C is the array. Since the number of courses is specified at runtime the array must be dynamically allocated in C. In C++ the vector and associated classes will take care of memory allocation and deallocation.

The next feature is the use of a pass by reference. This is used in the C++ program in a call to the convertCharToLetterGrade function. The workaround in C is simple which is to pass the letter grade by value and then have the C function return the corresponding number value.

Another feature used in the C++ program which is not available in C is the use of function templates in order to pass a vector of an unspecified type to a function. In C, the workaround was to use the C11 expression _Generic to implement a kind of compile-time polymorphism. Two functions which calculated and returned an average value were written and the _Generic expression determines at compile time which function should be called. Furthermore, class vector comes with data member size while C array has no such capability. To remedy this the size of the array was passed to both of the value averaging functions.

Finally the C++ class vector is capable of increasing and decreasing its capacity on demand. In C if more data is required to be stored a call to standard function realloc must be made. Also at the end of the life of the arrays they must be freed or a memory leak will result. Vector on the other hands frees all allocated memory after its scope is expired.