For this assignment, you will write a complete C++ program that allows the user to perform some simple analysis on a DNA sequence.

Each DNA sequence must be stored in the program as an array of characters. The maximum number of characters in a DNA sequence is 20. An asterisk, *, must be placed in the array to mark the end of the sequence. Therefore, an array of size 21 is needed for each DNA sequence.

When reading a DNA sequence from the keyboard, each DNA character will be separated by whitespace and an asterisk will denote the end of the sequence.

For example, the DNA Sequence ATC shown at right must be stored in an array as:

```
A T C *
```

The * character will tell your program where in the array the DNA sequence ends.

The analyses you must perform are:

Statistics:
Input a DNA sequence and count the number of times each of the characters A, T, G, and C appear in that DNA Sequence.

Compare:
Input two DNA sequences and determine if they are the same and print a message to the screen.

Contains:
Input two DNA sequences and determine if the second sequence is contained in the first sequence and print a message to the screen.
Notes:

- The user can input upper or lower case letters. You must change all DNA sequences to upper case.

- The user will never input invalid DNA data. The user might input an invalid menu choice. If an invalid menu choice is given, prompt again for the choice without redisplaying the menu.

- A DNA Sequence will never be longer than 20 letters.

- You must use the functions listed on the next page. You are encouraged to add more functions.

Remember

- Code and test one function at a time.

- The debugger is your friend!
You must use the following functions:

- **void printTitle (string title);**
  
  Prints the title passed to the function, including the border of stars, to the screen.

- **void displayMenu ();**
  
  Displays the menu to the screen.

- **int getChoice ();**
  
  Prompt the user for a menu choice until a valid input is received. Return the user's choice to the calling function.

- **void readString (char DNA[]);**
  
  Read a DNA sequence from the keyboard into the parameter DNA. The * character marks the end of the DNA sequence in the array.

- **bool printString (char DNA[]);**
  
  Print the DNA sequence stored in DNA to the screen. Do not print the * character.

- **bool containsString (char DNA[], char DNA2[]);**
  
  Check to see if DNA2 is contained in DNA as a substring and return true if it is and false otherwise.

- **bool compare (char DNA[], char DNA2[]);**
  
  Compare the DNA sequences in DNA and DNA2 and return true if they are the same and false otherwise.

- **int countCharOccurences (char letter, char DNA[]);**
  
  Count how many times the character letter appears in DNA. Return that count.
To complete this assignment you must submit the following:

1. An electronic copy of your program on Grace
   a. Add a new project named 06DNA to your previously created assignment solution called PUNetIDAssignments. It is vital that you name your project correctly!
   b. Type your program (fully documented/commented) into the project. We are now commenting each function in a program. You must follow the coding standards!
   c. Pay attention to the example output! Your program’s output must look exactly like the example output! The spacing and newlines in your output must match exactly.
   d. Make sure that your program compiles and runs correctly. If you get any errors, double check that you typed everything correctly.
   e. Make sure that your program does not produce any warnings.
   f. Once you are sure that the program works correctly it is time to submit your program. You do this by logging on to Grace and placing your complete solution folder in the CS150-02 or CS 150-03 Drop folder. This solution folder must contain seven projects.
   g. The program must be in the drop folder by either 8:00am (03) or 9:15am (02) on the day that it is due. Anything submitted after that will be considered late.

2. A hard copy of your program
   a. The hard copy must be placed on the instructor’s desk by 8:00am (03) or 9:15am (02) on the day that it is due.
   b. The hard copy must be printed in color, double-sided, and stapled if necessary.
   c. Your tab size must be set to 2 and you must not go past column 80 in your output.

Good luck! And remember, if you have any problems, come and see me straight away. 😊