```cpp
////////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////////////////
//                              UTILITIES 121                             //
//                             utilities121.cpp                           //
//                                                                        //
// Written By :                          Environment :                    //
// Date ......:                          Compiler ...:                    //
////////////////////////////////////////////////////////////////////////////
////////////////////////////////////////////////////////////////////////////

////////////////////////////////////////////////////////////////////////////
//                                #includes                               //
////////////////////////////////////////////////////////////////////////////
#include "utilities121.h"
#include <iostream>
#include <sstream>
#include <stdexcept>
#include <limits>
#include <random>

using namespace std;
////////////////////////////////////////////////////////////////////////////
//                            Function Definitions                        //
////////////////////////////////////////////////////////////////////////////
/*****************************************************************************
*                              void pause(void)                              *
*                                                                            *
*       Description ....: Delay the system so that the user can read what    *
*                         is written to standard output.                     *
*                                                                            *
*                                                                            *
* Written By : Michael R. Nowak         Environment : Mac OS X 10.10.5       *
* Date ......: 2017/10/01               Compiler ...: Homebrew GCC 6.3.0_1   *
*****************************************************************************/
void pause(void)
{
    std::string temp;
    std::cout << std::endl << "[Press RETURN to continue]" << std::endl;
    std::getline(std::cin, temp);
}

/*****************************************************************************
*                            char upChar(char c)                             *
*                                                                            *
*       Description ....: Converts an uppercase character to a lower
case                                                                         *
*        character. If a non-character is inputted, that input is
returned                                                                     *
*         the user                                                                 *
* Written By :   Maria Dmitrievskaia    Environment :  Windows 10                  *
* Date ......:  02/19/19                Compiler ...:  Putty                   *
*****************************************************************************/
char upChar(char c)
{
    if (c >= 97 && c <= 122)
        c-=32;
    return c;
}

/*****************************************************************************
*                            char lowChar(char c)                            *
*                                                                            *
*       Description ....: Converts a lowercase character to an upper
case                                                                         *
*       character. If a non-character is inputted, that input is
returned                                                                     *
*       the upper                                                            *
*                                                                            *
*                                                                            *
```

```
66   * Written By : Maria Dmitrievskaia      Environment : Windows 10             *
67   * Date ......: 02/19/19                 Compiler ...: Putty                  *
68   ********************************************************************************/
69   char lowChar(char c)
70   {
71       if (c >=65 && c <=90)
72           c+=32;
73
74       return c;
75   }
76
77   /*******************************************************************************
78   *                    std::string upperStr(std::string s)                      *
79   *                                                                             *
80   *       Description ....: Converts a string of characters to a string
81           containing only uppercase
             characters.                                                    *
82   *                                                                             *
83   *                                                                             *
84   * Written By :  Maria Dmitrievskaia     Environment :   Windows 10           *
85   * Date ......:   02/19/02               Compiler ...:   Putty                *
86   ********************************************************************************/
87   string upperStr(string const& Input)
88   {
89       string upper = "";
90       for(int i = 0; i < Input.size();++i){
91           upper += upChar(Input[i]);
92       }
93       return upper;
94   }
95
96   /*******************************************************************************
97   *                    std::string lowerStr(std::string s)                      *
98   *                                                                             *
99   *       Description ....:  Converts a string of characters to a
     string                              *
100  *         containing only lowercase
     characters.                                                                  *
101  *                                                                             *
102  * Written By : Maria Dmitrievskaia      Environment :  Windows 10            *
103  * Date ......: 02/19/19                 Compiler ...:  Putty                  *
104  ********************************************************************************/
105  string lowerStr(string const& Input)
106  {
107      string lower = "";
108      for(int i = 0; i < Input.size();++i){
109          lower += lowChar(Input[i]);
110      }
111      return lower;
112  }
113
114  /*******************************************************************************
115  *                         std::string to_str(int i)                           *
116  *                                                                             *
117  *       Description ....:  The function creates a string containing a passed *
118          integer value.                                                        *
119  *                                                                             *
120  * Written By : Wesley Myers             Environment : Windows 10             *
121  * Date ......: 02/19/19                 Compiler ...: Putty                  *
122  ********************************************************************************/
123  string toStr(int i)
124  {
125      stringstream ss;
126      ss << i;
127      string s = ss.str();
128      return s;
129  }
130
131  /*******************************************************************************
```

```
132  *                        std::string to_str(double d)                        *
133  *                                                                            *
134  *       Description ....:  The function creates a string containing a passed *
135         floating point value.
            *                                                    *
136  *                                                                            *
137  *                                                                            *
138  * Written By : Wesley Myers             Environment : Windows 10             *
139  * Date ......: 02/19/19                  Compiler ...: Putty                 *
140  ******************************************************************************/
141  string toStr(double i)
142  {
143      stringstream ss;
144      ss << i;
145      string s = ss.str();
146      return s;
147  }
148
149  /******************************************************************************
150  *          int getInt(int low, int high, std::string const& prompt)          *
151  *                                                                            *
152  *       Description ....: Asks user to input a number between passed high and
153  *       low values.
154  *                                                                            *
155  *                                                                            *
156  * Written By : Wesley and Maria         Environment : Windows 10               *
157  * Date ......: 02/19/19                  Compiler ...: Putty                 *
158  ******************************************************************************/
159  int getInt(int low, int high, std::string const& prompt)
160  {
161      cout << prompt;
162      cout << "Enter an integer value between " << low << " and  " << high << endl;
163      int input;
164      do
165      {
166          cin >> input;
167          if (cin.bad())
168          {
169              throw runtime_error("stream corrupted");
170              break;
171          }
172          if (cin.fail())
173          {
174
175              cout << "Input you have provided is invalid..." << endl << "Please try
                 again:" << endl;
176              cin.clear();
177              cin.ignore(numeric_limits <streamsize>::max ( ) , '\n');
178              cin >>input;
179          }
180          if (cin.eof()) {
181              throw runtime_error("unexpected eof");
182              break;
183          }
184
185          if (input <= low || input >= high)
186          {
187              cout << "Input not in range...\nplease try again" << endl;
188          }
189
190      } while (!cin.good() || (input <= low || input >= high));
191
192      return input;
193  }
194
195  /******************************************************************************
196  *            double getDouble(double low, double high, double tolerance,     *
197  *                                          std::string const& prompt)        *
198  *                                                                            *
```

```
199  *       Description ....:                                                *
200  *                                                                        *
201  *                                                                        *
202  * Written By :  Maria and Wesley     Environment :  Windows 10                    *
203  * Date .......:  02/19/19               Compiler ...:   Putty                *
204  **************************************************************************/
205  double getDouble(double low, double high, double tolerance, std::string const& prompt)
206  {
207      cout << prompt;
208      cout << "Enter a double value between " << low << " and  " << high << endl;
209      double input;
210      double lower_low = low-tolerance;
211      double higher_high = high + tolerance;
212      do
213      {
214          cin >> input;
215          if (cin.bad())
216          {
217              throw runtime_error("stream corrupted");
218              break;
219          }
220          if (cin.fail())
221          {
222              cout << "Input you have provided is invalid..." << endl << "Please try
                 again:" << endl;
223              cin.clear();
224              cin.ignore(numeric_limits <streamsize>::max ( ) , '\n ');
225              cin >> input;
226          }
227          if (cin.eof()) {
228              throw runtime_error("unexpected eof");
229              break;
230          }
231
232          if ((input <= (lower_low) )|| (input >= (higher_high)))
233          {
234              cout << "Input not in range...\nplease try again" << endl;
235          }
236
237      } while (!cin.good() || ((input <= lower_low) || (input >= higher_high)));
238
239      return input;
240  }
241
242
243  /**************************************************************************
244  *                          void clearScreen(void)                        *
245  *                                                                        *
246  *       Description ....: This function clears the contents of the terminal  *
247  *          window                                                            *
248  *                                                                        *
249  * Written By :  Maria Dmitrievskaia    Environment :  Window 10                 *
250  * Date .......:   02/19/19             Compiler ...:  Putty               *
251  **************************************************************************/
252  void clearScreen(void)
253  {
254      system("clear");
255  }
```