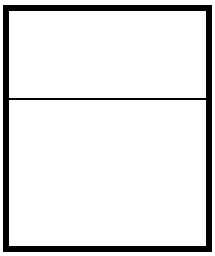

Name 1: _____

Class Day / Time: _____

Due Date: _____

BMI Calculator

Write a program that will calculate a user's BMI.

First Write on paper prototypes for the following functions

1 – Get and Check User's name, age, weight and height (Error check age for a reasonable range for an adult, error check weight for 100 – 3000 lbs, error check height for 48 inches to 84 inches).

2 – Calculate the user's BMI (use this formula **BMI = Weight (lb) / (Height (in) x Height (in)) x 703**)

3 – Output the user's name and BMI.

Next, on paper write the main that will allow the user to input as many age, weight height combos as they would like.

Finally, type in the code and test with the input specified.

HINT: Write the main first. Comment out the bulk of it. Uncomment as you go. Write one function – then test it before moving on to the next function. Finally, add the loop and re-test.

INPUT/OUTPUT – should be formatted as follows – Triple space between tests

```
************************************************
*  PROGRAMMED BY : Michele Rousseau
*  STUDENT ID    : 7502312
*  CLASS         : CS1A- MW - 6p-7:30p
*  LAB #0        : Sample Code
************************************************

*********************************
*  WELCOME TO THE BMI CALCULATOR *
*********************************

Name: Dave Nonsense
Age (in years): 45
Weight (in lbs): 305
Height (in inches): 72

Dave Nonsense is 45 year's old and has a BMI of 41.4.

*************************************************
```

```
Name: Florence Nadeau
Age (in years): 90
Weight (in lbs): 100
Height (in inches): 64

Florence Nadeau is 90 year's old and has a BMI of 17.2.

******************************************************

Name: Steve Lynn
Age (in years): 15

**** INVALID INPUT!
**** PLEASE INPUT A VALUE BETWEEN
**** 18 and 130

Age (in years): 60
Weight (in lbs): 90

**** INVALID INPUT!
**** PLEASE INPUT A VALUE BETWEEN
**** 100 and 3000

Weight (in lbs): 185
Height (in inches): 24

**** INVALID INPUT!
**** PLEASE INPUT A VALUE BETWEEN
**** 48 and 84

Height (in inches): 70

Steve Lynn is 60 year's old and has a BMI of 26.5.

******************************************************

Name: Done

*****************************************
*  THANK YOU FOR USING THE BMI CALCULATOR  *
*       AND REMEMBER TO STAY HEALTHY       *
*****************************************
```

CODE – INT MAIN()

Prototypes – can go in a header file

(I put them in main in case we haven't covered them yet.)

```
/*******************************************************************
 * AUTHOR     : Michele Rousseau & Someone Else
 * STUDENT ID : 123456          & 789101
 * LAB #00    : BMI Calculator
 * CLASS      : CS1A
 * SECTION    : MW: 7:30a
 * DUE DATE   : 12/20/26
 *******************************************************************/
#include <iostream>  /** cout                          **/
#include <iomanip>   /** setprecision() & fixed() **/
#include <string>
using namespace std;


/*******************************************************************
 * PrintHeader
 *   This function receives an assignment name, type
 *   and number then outputs the appropriate header
 *   ==> returns nothing - This will output the class heading.
 *******************************************************************/
void PrintHeader(string asName, // IN - assignment Name – used for output
                 char   asType, // IN - assignment type
                                //    - (LAB or ASSIGN) – used for output
                 int    asNum); // IN – assign. number  – used for output

/*******************************************************************
 * GetAndCheckUsersData
 *    This function will read in as input the user's name, age, weight
 *          & height.
 *       If "Done" is input for name the other values will not be input. Because
 *          "Done" is the exit value for the main loop.
 *       All numerical input will be error checked within the
 *          following ranges (inclusively).
 *                  Age    :  18 -  130
 *                  Weight: 100 - 3000
 *                  Height:  48 -   84
 *    ==> the arguments into these parameters WILL BE MODIFIED
 *                name,
 *                age,
 *                weight,
 *                height
 *******************************************************************/
void GetAndCkPersonsData (string &name,    // OUT - name input from user
                          int    &age,     // OUT - age input from user
                          int    &weight,  // OUT - weight input from user
                          int    &height); // OUT - height input from user
```

```
/*************************************************************************
 * CalculateBMI
 *    This function receives the weight and height and calculates
 *        the BMI (Body Mass Index) based on the following formula:
 *        BMI = Weight (lb) / (Height (in) x Height (in)) x 703)
 *    ==> returns the BMI
 *************************************************************************/
float CalculateBMI(int weight,  // IN - weight used to calc the BMI
                   int height); // IN - height used to calc the BMI


/*************************************************************************
 * OutputBMI
 *    This function format and output the name, age and BMI.
 *        BMI should be formatted in the calling function.
 *    ==> returns nothing ==> it will output the name age and BMI.
 *************************************************************************/
void OutputBMI(string name,  // IN - name to be output
               int    age,   // IN - age to be output
               float  bmi);  // IN - BMI to be output



/*************************************************************************
 * BMI CALCULATOR
 *-----------------------------------------------------------------------
 *    This program will calculate and output as many BMIs (Body Mass Indexes)
 *       until the user inputs a -1 for the age input. The BMI will be
 *       calculated based on the user's age, weight, and height information.
 *-----------------------------------------------------------------------
 *    INPUT
 *       The following information will be input for each BMI calculated
 *          nameM   :  The name associated with the BMI calculation
 *          ageM    :  The age in years
 *          weightM :  The weight in lbs
 *          heightM :  The height in inches
 *
 *    OUTPUT
 *          nameM :  The name associated with the BMI calculation
 *          bmiM  :  The BMI calculated based on ageM, weightM, & heightM
 *************************************************************************/
int main ()
{
      string nameM;   // IN & OUT   - The name associated with the BMI calc.
      int    ageM;    // IN & OUT   - The age of the person
      int    weightM; // IN & CALC  - The weight used to calc the BMI
      int    heightM; // IN & CALC  - The height used to calc the BMI
      float  bmiM;    // CALC & OUT - The calculated Body Mass Index (BMI)


      // OUTPUT: Class heading to the console
      PrintHeader("Sample Code", 'L', 0);
```

```
	// OUTPUT: Heading for the program
	cout << "**********************************\n"
		"*  WELCOME TO THE BMI CALCULATOR *\n"
		"**********************************\n\n";

	// Formats the floating point values (BMI)
	cout << setprecision(1) << fixed;


	/*****************************************************************
	 * INPUT - gets the name, age, weight and height - all arguments will
	 *         be modified in this function and will contain input values
	 *****************************************************************/
	GetAndCkPersonsData(nameM, ageM, weightM, heightM);

	/*****************************************************************
	 * PROCESSING - This is the primary loop for the program.
	 *              It will read in input, calculate and output the BMI until the
	 *              user inputs "Done" for name.
	 *****************************************************************/
	while(nameM != "Done")
	{
		// PROCESSING - Calculates the BMI based on the weightM & heightM
		bmiM = CalculateBMI(weightM, heightM);

		// OUTPUT - Outputs the nameM, ageM, and bmiM
		OutputBMI(nameM, ageM, bmiM );
		cout << "*******************************************************\n\n";

		/*****************************************************************
		 * INPUT - gets the name, age, weight and height - all arguments will
		 *         be modified in this function and will contain input values
		 *****************************************************************/
		GetAndCkPersonsData(nameM, ageM, weightM, heightM);

	} // END - while(nameM != "Done")


	// OUTPUT: Thank you
	cout << endl
		<<   "*********************************************\n"
		     "*  THANK YOU FOR USING THE BMI CALCULATOR  *\n"
		     "*       AND REMEMBER TO STAY HEALTHY!      *\n"
		     "*********************************************\n\n";
	return 0;
}
```

FUNCTIONS – Note: Each function should be in a separate source file

```
/*****************************************************************
 * AUTHOR     : Michele Rousseau & Someone Else
 * STUDENT ID : 123456          & 789101
 * LAB #00    : BMI Calculator
 * CLASS      : CS1A
 * SECTION    : MW: 7:30a
 * DUE DATE   : 12/20/26
 *****************************************************************/
#include <iostream>   /** cout   **/
#include <iomanip>    /** setw() **/
#include <string>
using namespace std;

/*****************************************************************
 * FUNCTION PrintHeader
 *---------------------------------------------------------------
 *   This function receives an assignment name, type
 *       and number then outputs the appropriate class heading.
 *   ==> returns nothing - This will output the class heading.
 *---------------------------------------------------------------
 * PRE-CONDITIONS
 *     The following need a defined value passed in
 *         asName: Assignment Name
 *         asType: Assignment Type
 *         asNum : Assignment Number
 *
 * POST-CONDITIONS
 *     ==> Returns nothing - This function will output the class heading.
 *****************************************************************/
 void PrintHeader(string asName, // IN - assignment Name – used for output
                  char   asType, // IN - assignment type
                                 //    - (LAB or ASSIGN) – used for output
                  int    asNum)  // IN – assign. Number  - used for output
 {
   cout << left;
   cout << "*************************************************\n";
   cout << "*  PROGRAMMED BY : Michele Rousseau\n";
   cout << "*  " << setw(14) << "STUDENT ID"  << ": 7502312\n";
   cout << "*  " << setw(14) << "CLASS" << ": CS1A - MW - 6p-7:30p\n";
   cout << "*  " ;

   // PROCESSING – This will adjust setws and format appropriately
   //              based on if this is a lab 'L' or assignment
   if (toupper(asType) == 'L')
   {
       cout << "LAB #" << setw(9);
   }
   else
   {
       cout << "ASSIGNMENT #" << setw(2);
   }

   cout << asNum << ": " << asName << endl;
   cout << "*************************************************\n\n";
   cout << right;
 }
```

FUNCTIONS – GET AND CHECK USER DATA is too long and repetitive
HOW CAN WE MODIFY THIS TO MAKE IT SHORTER AND LESS REPETITIVE?

```
/*****************************************************************************
 * AUTHOR     : Michele Rousseau & Someone Else
 * STUDENT ID : 123456           & 789101
 * LAB #00    : BMI Calculator
 * CLASS      : CS1A
 * SECTION    : MW: 7:30a
 * DUE DATE   : 12/20/26
 *****************************************************************************/
#include <iostream>  /** cin **/
#include <string>
using namespace std;

 /*****************************************************************************
  * FUNCTION GetAndCheckUsersData
  * ---------------------------------------------------------------------------
  *    This function will read in as input the user's name, age, weight
  *       & height.
  *    If "Done" is input for name the other values will not be input,
  *       because "Done" is the exit value for the main loop.
  *    All numerical input will be error checked within the
  *       following ranges (inclusively).
  *               Age    :  18 -  130
  *               Weight: 100 - 3000
  *               Height:  48 -   84
  *---------------------------------------------------------------------------
  * PRE-CONDITIONS
  *     The following arguments need to be variables - but do not need values
  *       name   : person's full name
  *       age    : person's age
  *       weight : person's weight
  *       height : person's height
  *
  * POST-CONDITIONS
  *      ==> THE ARGUMENTS FOR FOLLOWING PARAMETERS WILL BE MODIFIED.
  *          Input read in in the function will be stored here and
  *          returned via the parameters.
  *                name
  *                age
  *                weight
  *                height
  *****************************************************************************/
 void GetAndCkPersonsData (string &name,   // OUT - name input from user
                           int    &age,    // OUT - age input from user
                           int    &weight, // OUT - weight input from user
                           int    &height) // OUT - height input from user
 {
```

```
/**********************************************************************
 * CONSTANTS
 * ---------------------------------------------------------------------
 * PROCESSING - The following represent the boundaries for the age,
 *                weight, & height and will be used for
 *                error checking the input (these values are inclusive)
 *---------------------------------------------------------------------
 * AGE_MIN    : Minimum age
 * AGE_MAX    : Maximum age
 *
 * WEIGHT_MIN : Minimum weight
 * WEIGHT_MAX : Maximum weight
 *
 * HEIGHT_MIN : Minimum height
 * HEIGHT_MAX : Maximum height
 **********************************************************************/
const int AGE_MIN = 18;
const int AGE_MAX = 130;

const int WEIGHT_MIN = 100;
const int WEIGHT_MAX = 3000;

const int HEIGHT_MIN = 48;
const int HEIGHT_MAX = 84;


bool invalidAge;     // CALC - invalid age range
bool invalidWeight;  // CALC - invalid weight range
bool invalidHeight;  // CALC - invalid height range


/**********************************************************************
 *  INPUT - The following code will read in a person's name, age,
 *          weight, and height.
 *          age, height and weight will be error checked.
 **********************************************************************/
cout << "Name: ";
getline(cin, name);

// If name is == "Done" then don't get the rest of the input
if (name != "Done")
{
      // INPUT: Age and error check between AGE_MIN & AGE_MAX
      //        inclusively
      do
      {
            cout << "Age (in years): ";
            cin  >> age;

            invalidAge = age < AGE_MIN || age > AGE_MAX;

            // PROC: if the input is invalid output an error message
            if (invalidAge)
            {
                  cout << endl
                       << "**** INVALID INPUT!\n"
```

```
                        "**** PLEASE INPUT A VALUE BETWEEN\n"
                        "**** " << AGE_MIN << " and " << AGE_MAX
                    << endl << endl;
            }
        }while (invalidAge);

        cin.ignore(10000, '\n');


        // INPUT: weight and error check between WEIGHT_MIN & WEIGHT_MAX
        //        inclusively
        do
        {
            cout << "Weight (in lbs): ";
            cin  >> weight;

            invalidWeight = weight < WEIGHT_MIN || weight > WEIGHT_MAX;

            // PROC: if the input is invalid output an error message
            if (invalidWeight)
            {
                cout << endl
                    << "**** INVALID INPUT!\n"
                       "**** PLEASE INPUT A VALUE BETWEEN\n"
                       "**** " << WEIGHT_MIN << " and " << WEIGHT_MAX
                    << endl << endl;
            }

        }while (invalidWeight);

        cin.ignore(10000, '\n');


        // INPUT: height and error check between WEIGHT_MIN & WEIGHT_MAX
        //        inclusively
        do
        {
            cout << "Height (in inches): ";
            cin  >> height;

            invalidHeight = height < HEIGHT_MIN || height > HEIGHT_MAX;

            // PROC: if the input is invalid output an error message
            if (invalidHeight)
            {
                cout << endl
                    << "**** INVALID INPUT!\n"
                       "**** PLEASE INPUT A VALUE BETWEEN\n"
                         "**** " << HEIGHT_MIN << " and " << HEIGHT_MAX
                    << endl << endl;
            }

        }while (invalidHeight);

        cin.ignore(10000, '\n');
    } // END  if (name != "Done")
}
```

```
/*******************************************************************************
 * AUTHOR     : Michele Rousseau & Someone Else
 * STUDENT ID : 123456           & 789101
 * LAB #00    : BMI Calculator
 * CLASS      : CS1A
 * SECTION    : MW: 7:30a
 * DUE DATE   : 12/20/26
 *******************************************************************************
#include <math.h>       /** pow **/
using namespace std;


 /*******************************************************************************
  * FUNCTION CalculateBMI
  * -----------------------------------------------------------------------------
  *    This function receives the weight and height and calculates
  *        the BMI (Body Mass Index) based on the following formula:
  *        BMI = Weight (lb) / (Height (in) x Height (in)) x 703)
  *    ==> returns the BMI
  *-----------------------------------------------------------------------------
  * PRE-CONDITIONS
  *     The following need a defined value passed in
  *       weight: weight used to calculate the BMI
  *       height: height used to calculate the BMI
  *
  * POST-CONDITIONS
  *     ==> Returns the calculated BMI
  *******************************************************************************/
 float CalculateBMI(int weight,  // IN - weight used to calc the BMI
                    int height)  // IN - height used to calc the BMI

 {
       // PROC: pow will provide height squared
       //       703 is a value defined as part of the BMI calculation
       return weight / pow(height, 2) * 703;
 }
```

```
/*****************************************************************************
 * AUTHOR     : Michele Rousseau & Someone Else
 * STUDENT ID : 123456          & 789101
 * LAB #00    : BMI Calculator
 * CLASS      : CS1A
 * SECTION    : MW: 7:30a
 * DUE DATE   : 12/20/26
 *****************************************************************************
#include <iostream>       /** cout **/
using namespace std;

 /*************************************************************************
  * FUNCTION OutputBMI
  *------------------------------------------------------------------------
  *    This function format and output the name, age and BMI.
  *       BMI should be formatted in the calling function unless the
  *       default format is preferred.
  *    ==> returns nothing ==> it will output
  *------------------------------------------------------------------------
  * PRE-CONDITIONS
  *     The following need a defined value passed in
  *       name : person's full name
  *       age  : person's age
  *       bmi  : person's Body Mass Index
  *
  * POST-CONDITIONS
  *     ==> Returns nothing - This function will output name, age, & bmi
  *************************************************************************/
 void OutputBMI(string name,  // IN - name to be output
                int    age,   // IN - age to be output
                float  bmi)   // IN - BMI to be output

 {

       // OUTPUT - name, age & bmi
       cout << endl
            << name << " is "
            << age  << " year\'s old"
            << " and has a BMI of "
            << bmi << '.' << endl << endl;
 }
```