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// ****************** Lab1.c ***************
// Program written by: Michael Blume
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// Brief description of the Lab
// An embedded system is capturing temperature data from a
// sensor and performing analysis on the captured data.
// The controller part of the system is periodically capturing N
// readings of the temperature sensor. Your task is to write three
// analysis routines to help the controller perform its function
//   The three analysis subroutines are:
//    1. Calculate the mean of the temperature readings
//       rounded down to the nearest integer
//    2. Calculate the range of the temperature readings,
//       defined as the difference between the largest
//       and smallest reading
//    3. Check if the captured readings are a non-increasing montonic series
//       This simply means that the readings are sorted in non-increasing order.
//       We do not say "increasing" because it is possible for consecutive values
//       to be the same, hence the term "non-increasing". The controller performs
//       some remedial operation and the desired effect of the operation is to
//       lower the the temperature of the sensed system. This routine helps
//       verify whether this has indeed happened
#include <stdint.h>
#define True 1
#define False 0
#define N 21       // Number of temperature readings
uint8_t Readings[N]; // Array of temperature readings to perform analysis on

// Return the computed Mean
uint8_t Find_Mean(){
 uint16_t sum = 0;
 uint8_t index = 0;
 while (index < N){
  sum += Readings[index];
  index++;
 }
  return(sum/N);
}

// Return the computed Range
uint8_t Find_Range(){
 uint8_t max = 0;
 uint8_t min = 120;
 uint8_t count = 0;
 while (count < N) {
  if (Readings[count] > max) {
   max = Readings[count];
  }
  if (Readings[count] < min) {
   min = Readings[count];
  }
  count++;
 }
  return(max-min);
}
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// Return True of False based on whether the readings
// a non-increasing montonic series
uint8_t IsMonotonic(){
 uint8_t indexs = 0;
 while (indexs < N-1) {
   if (Readings[indexs+1] > Readings[indexs]){
    return(False);
   }
  indexs++;
 }
  return(True);
}

//Testcase 0:
// Scores[N] = {80,75,73,72,90,95,65,54,89,45,60,75,72,78,90,94,85,100,54,98,75};
// Range=55 Mean=77 IsMonotonic=False
//Testcase 1:
// Scores[N] = {100,98,95,94,90,90,89,85,80,78,75,75,75,73,72,72,65,60,54,54,45};
// Range=55 Mean=77 IsMonotonic=True
//Testcase 2:
// Scores[N] = {80,80,80,80,80,80,80,80,80,80,80,80,80,80,80,80,80,80,80,80,80};
// Mean=80 Range=0 IsMonotonic=True
//Testcase 3:
// Scores[N] = {100,80,40,100,80,40,100,80,40,100,80,40,100,80,40,100,80,40,100,80,40};
// Mean=73 Range=60 IsMonotonic=False
//Testcase 4:
// Scores[N] = {100,95,90,85,80,75,70,65,60,55,50,45,40,35,30,25,20,15,10,5,0};
// Range=100 Mean=50 IsMonotonic=True
```