using System;  
using System.Collections.Generic;  
using System.Diagnostics;  
using static System.Console;  
  
namespace ASD\_Lab1\_Mychkovskyi  
{  
 class Program  
 {  
 static void Main(string[] args)  
 {  
 WriteLine("Bogdan Mychkovskyi IPZ-12-1");  
  
 int[] a10 = new int[10];  
 int[] a200 = new int[500];  
   
 List<int> list10 = new List<int>();  
 List<int> list200 = new List<int>();  
   
 Random rand = new Random();  
 for (int i = 0; i < a10.Length; i++)  
 {  
 a10[i] = rand.Next(0, 500);  
 Write($"{a10[i]} ");  
 }  
 WriteLine("\n");  
 for (int i = 0; i < a200.Length; i++)  
 {  
 a200[i] = rand.Next(0, 500);  
 Write($"{a200[i]} ");  
 }  
   
 for (int i = 0; i < a10.Length; i++)  
 list10.Add(a10[i]);  
 for (int i = 0; i < a200.Length; i++)   
 list200.Add(a200[i]);  
   
 Write("\n\nInput number to serach for small array: ");  
 int search1 = Convert.ToInt32(ReadLine());  
 Write("Input number to serach for big array: ");  
 int search2 = Convert.ToInt32(ReadLine());  
  
 int menu = 0;  
 while (true)  
 {  
 try  
 {  
 WriteLine("\nChoose the algorithm number (1 - 4) or input 0 to exit");  
 menu = Convert.ToInt32(ReadLine());  
 WriteLine();  
 }  
 catch (Exception)  
 {  
 WriteLine("Input correct data");  
 }  
 switch (menu)  
 {  
 case 1:  
 Task1(a10, a200, list10, list200, search1, search2);  
 break;  
 case 2:  
 Task2(a10, a200, search1, search2);  
 break;  
 case 3:  
 Task3(a10, a200, search1, search2);  
 break;  
 case 4:  
 Task4(a10, a200, search1, search2);  
 break;  
 case 0:  
 goto end;  
 default:  
 WriteLine("Input correct data");  
 break;  
 }  
 }  
 end:  
 WriteLine("\tThanks for attention!");  
 }  
  
 static void Task1(int[] arr,int[] arr1, List<int> list, List<int> list1, int x1, int x2)  
 {  
 WriteLine("\nLinear search:\n");  
   
 var t1 = Stopwatch.StartNew();  
 int i = 0;  
 while (i < arr.Length)  
 {  
 if (arr[i] == x1)   
 break;  
 i++;  
 }  
 t1.Stop();  
  
 if (i == arr.Length)  
 WriteLine("Element does not found");  
 else WriteLine($"Element: {x1}; Index: {i}");  
 WriteLine($"Estimating time: {t1.Elapsed.TotalMilliseconds}; Array size: {arr.Length}\n");  
   
 var t3 = Stopwatch.StartNew();  
 i = 0;  
 while (i < arr.Length)  
 {  
 if (arr[i] == x2)   
 break;  
 i++;  
 }  
 t3.Stop();  
  
 if (i == arr1.Length)  
 WriteLine("Element does not found");  
 else WriteLine($"Element: {x2}; Index: {i}");  
 WriteLine($"Estimating time: {t3.Elapsed.TotalMilliseconds}; Array size: {arr1.Length}\n");  
   
 var t2 = Stopwatch.StartNew();  
 i = 0;  
 while (i < list.Count)  
 {  
 if (list[i] == x1)   
 break;  
 i++;  
 }  
 t2.Stop();  
   
 if (i == list.Count)  
 WriteLine("Element does not found");  
 else WriteLine($"Element: {x1}; Index: {i}");  
 WriteLine($"Estimating time: {t2.Elapsed.TotalMilliseconds}; List size: {list.Count}");  
   
 var t4 = Stopwatch.StartNew();  
 i = 0;  
 while (i < list1.Count)  
 {  
 if (list1[i] == x2)   
 break;  
 i++;  
 }  
 t4.Stop();  
   
 if (i == list1.Count)  
 WriteLine("Element does not found");  
 else WriteLine($"Element: {x2}; Index: {i}");  
 WriteLine($"Estimating time: {t4.Elapsed.TotalMilliseconds}; List size: {list1.Count}");  
 }  
 static void Task2(int[] arr, int[] arr1, int x1, int x2)  
 {  
 Stopwatch t1, t2, t3, t4;  
 WriteLine("Barrier searching:\n");  
  
 t1 = Stopwatch.StartNew();  
 int[] check1 = new int[arr.Length + 1];  
 arr.CopyTo(check1, 0);  
 check1[check1.Length - 1] = x1;  
 int i = 0;  
 while (check1[i] != x1)  
 {  
 i++;  
 }  
  
 t1.Stop();  
 if (i == check1.Length - 1)  
 WriteLine("Element does not exist");  
 else WriteLine($"Element: {x1}; Index: {i}");  
 WriteLine($"Estimating time: {t1.Elapsed.TotalMilliseconds}; Array size: {arr.Length}\n");  
  
  
 t2 = Stopwatch.StartNew();  
 int[] check2 = new int[arr1.Length + 1];  
 arr1.CopyTo(check2, 0);  
 check2[check2.Length - 1] = x2;  
 i = 0;  
 while (check2[i] != x2)  
 {  
 i++;  
 }  
 t2.Stop();  
 if (i == check2.Length - 1)  
 WriteLine("Element does not exist");  
 else WriteLine($"Element: {x2}; Index: {i}");  
 WriteLine($"Estimating time: {t2.Elapsed.TotalMilliseconds}; Array size: {arr1.Length}\n");  
  
  
 int j;  
 t3 = Stopwatch.StartNew();  
 var check3 = new List<int>();  
 for (j=0; j<arr.Length; j++)  
 check3.Add(arr[j]);  
 i = 0;  
 check3.Add(x1);  
 while (check3[i] != x1)  
 {  
 i++;  
 }  
 t3.Stop();  
 if (i == check3.Count - 1)  
 WriteLine("Element does not exist");  
 else WriteLine($"Element: {x1}; Index: {i}");  
 WriteLine($"Estimating time: {t3.Elapsed.TotalMilliseconds}; Array size: {arr.Length}\n");  
   
 t4 = Stopwatch.StartNew();  
 var check4 = new List<int>();  
 for (j=0; j<arr1.Length; j++)  
 check4.Add(arr1[j]);  
 i = 0;  
 check4.Add(x2);  
 while (check4[i] != x2)  
 {  
 i++;  
 }  
 t4.Stop();  
 if (i == check4.Count - 1)  
 WriteLine("Element does not exist");  
 else WriteLine($"Element: {x2}; Index: {i}");  
 WriteLine($"Estimating time: {t4.Elapsed.TotalMilliseconds}; Array size: {arr1.Length}\n");  
 }  
 static void Task3(int[] arr, int[] arr1, int x1, int x2)  
 {  
 WriteLine("Binary search:\n");  
  
 Array.Sort(arr);  
 Array.Sort(arr1);  
  
 Stopwatch t1, t2, t3, t4;  
 int begin = 0, end = arr.Length, c=0;  
 bool bb = false;  
 t1 = Stopwatch.StartNew();  
 while (begin < end)  
 {  
 c = begin + (end - begin) / 2;  
 if (x1 < arr[c]) end = c;  
 else if (x1 > arr[c]) begin = c + 1;  
 else  
 {  
 bb = true;  
 break;  
 }  
 }  
 t1.Stop();  
 if (bb)  
 WriteLine($"Element: {x1}; Index: {c}");  
 else WriteLine("Element does not found");  
 WriteLine($"Estimating time: {t1.Elapsed.TotalMilliseconds}; Array size: {arr.Length}\n");  
  
 begin = 0;  
 end = arr1.Length;  
 bb = false;  
 t2 = Stopwatch.StartNew();  
 while (begin < end)  
 {  
 c = begin + (end - begin) / 2;  
 if (x2 < arr1[c]) end = c;  
 else if (x2 > arr1[c]) begin = c + 1;  
 else  
 {  
 bb = true;  
 break;  
 }  
 }  
 t2.Stop();  
 if (bb)  
 WriteLine($"Element: {x2}; Index: {c}");  
 else WriteLine("Element does not found");  
 WriteLine($"Estimating time: {t2.Elapsed.TotalMilliseconds}; Array size: {arr1.Length}\n");  
  
  
 var list = new List<int>();  
 for (int i=0; i < arr.Length; i++)  
 list.Add(arr[i]);  
 begin = 0;  
 end = arr.Length;  
 bb = false;  
 t3 = Stopwatch.StartNew();  
 while (begin < end)  
 {  
 c = begin + (end - begin) / 2;  
 if (x1 < arr[c]) end = c;  
 else if (x1 > arr[c]) begin = c + 1;  
 else  
 {  
 bb = true;  
 break;  
 }  
 }  
 t3.Stop();  
 if (bb)  
 WriteLine($"Element: {x1}; Index: {c}");  
 else WriteLine("Element does not found");  
 WriteLine($"Estimating time: {t3.Elapsed.TotalMilliseconds}; List size: {list.Count}\n");  
   
 var list1 = new List<int>();  
 for (int i=0; i < arr1.Length; i++)  
 list1.Add(arr1[i]);  
 begin = 0;  
 end = arr1.Length;  
 bb = false;  
 t4 = Stopwatch.StartNew();  
 while (begin < end)  
 {  
 c = begin + (end - begin) / 2;  
 if (x2 < arr1[c]) end = c;  
 else if (x2 > arr1[c]) begin = c + 1;  
 else  
 {  
 bb = true;  
 break;  
 }  
 }  
 t4.Stop();  
 if (bb)  
 WriteLine($"Element: {x2}; Index: {c}");  
 else WriteLine("Element does not found");  
 WriteLine($"Estimating time: {t4.Elapsed.TotalMilliseconds}; List size: {list1.Count}\n");  
 }  
 static void Task4(int[] arr, int[] arr1, int x1, int x2)  
 {  
 WriteLine("Binary search with gold cut:\n");  
  
 Array.Sort(arr);  
 Array.Sort(arr1);  
  
 Stopwatch t1, t2, t3, t4;  
 int begin = 0, end = arr.Length, c=0;  
 bool bb = false;  
 t1 = Stopwatch.StartNew();  
 while (begin < end)  
 {  
 c = (int) (begin + (end - begin) / 1.61803398);  
 if (x1 < arr[c]) end = c;  
 else if (x1 > arr[c]) begin = c + 1;  
 else  
 {  
 bb = true;  
 break;  
 }  
 }  
 t1.Stop();  
 if (bb)  
 WriteLine($"Element: {x1}; Index: {c}");  
 else WriteLine("Element does not found");  
 WriteLine($"Estimating time: {t1.Elapsed.TotalMilliseconds}; Array size: {arr.Length}\n");  
  
 begin = 0;  
 end = arr1.Length;  
 bb = false;  
 t2 = Stopwatch.StartNew();  
 while (begin < end)  
 {  
 c = (int) (begin + (end - begin) / 1.61803398);  
 if (x2 < arr1[c]) end = c;  
 else if (x2 > arr1[c]) begin = c + 1;  
 else  
 {  
 bb = true;  
 break;  
 }  
 }  
 t2.Stop();  
 if (bb)  
 WriteLine($"Element: {x2}; Index: {c}");  
 else WriteLine("Element does not found");  
 WriteLine($"Estimating time: {t2.Elapsed.TotalMilliseconds}; Array size: {arr1.Length}\n");  
  
  
 var list = new List<int>();  
 for (int i=0; i < arr.Length; i++)  
 list.Add(arr[i]);  
 begin = 0;  
 end = arr.Length;  
 bb = false;  
 t3 = Stopwatch.StartNew();  
 while (begin < end)  
 {  
 c = (int) (begin + (end - begin) / 1.61803398);  
 if (x1 < arr[c]) end = c;  
 else if (x1 > arr[c]) begin = c + 1;  
 else  
 {  
 bb = true;  
 break;  
 }  
 }  
 t3.Stop();  
 if (bb)  
 WriteLine($"Element: {x1}; Index: {c}");  
 else WriteLine("Element does not found");  
 WriteLine($"Estimating time: {t3.Elapsed.TotalMilliseconds}; List size: {list.Count}\n");  
   
 var list1 = new List<int>();  
 for (int i=0; i < arr1.Length; i++)  
 list1.Add(arr1[i]);  
 begin = 0;  
 end = arr1.Length;  
 bb = false;  
 t4 = Stopwatch.StartNew();  
 while (begin < end)  
 {  
 c = (int) (begin + (end - begin) / 1.61803398);  
 if (x2 < arr1[c]) end = c;  
 else if (x2 > arr1[c]) begin = c + 1;  
 else  
 {  
 bb = true;  
 break;  
 }  
 }  
 t4.Stop();  
 if (bb)  
 WriteLine($"Element: {x2}; Index: {c}");  
 else WriteLine("Element does not found");  
 WriteLine($"Estimating time: {t4.Elapsed.TotalMilliseconds}; List size: {list1.Count}\n");  
 */\*  
 \* f = 1.61803398  
 \* c = begin + (end - begin) / f;  
 \*/* }  
 }  
}