```
// HW1_Exercise2_1

#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>
#include <time.h>

bool is_sorted(int *a, int n)
{
	while ( --n >= 1){
		if (a[n] < a[n-1]) return false;
	}
	return true;
}

void swap(int *x, int *y)
{
	int temp;
	temp = *x;
	*x = *y;
	*y = temp;
}

void bogosort(int *a, int n, int l, int r)
{
	int i;
	if (l == r)
	{
		if (is_sorted(a, n)){
			printf("the sorted input array is : ");
			for (int j=0; j<n; j++)printf("%d ", a[j]);
			return;
		}
	}else
	{
		for (i=l; i<=r; i++)
		{
			swap((a+l), (a+i));
			bogosort(a, n, l+1, r);
			swap((a+l), (a+i));
		}
	}
}
void doit(int *a, int n)
{
	clock_t start_t, end_t;
	start_t = clock();
	bogosort(a, n, 0, (n-1));
```

```
	end_t = clock();
	double total_t = (double)(end_t - start_t);
	double timeinSeconds = total_t/(double)CLOCKS_PER_SEC;
	printf("\n");
	printf("the runtime is : %f s", timeinSeconds);
	printf("\n");
}

int main()
{
	int first_numbers[] = { 7, 32, 12};
	int first_n = 3;
	doit(first_numbers, first_n);
	int second_numbers[] = { 1, 33, 12, 14, 88};
	int second_n = 5;
	doit(second_numbers, second_n);
	int third_numbers[] = { 33, 1, 12, 3, 15, 88, 23, 8};
	int third_n = 8;
	doit(third_numbers, third_n);
	int fourth_numbers[] = { 12, 43, 55, 3, 1, 9, 19, 10, 300, 18};
	int fourth_n = 10;
	doit(fourth_numbers, fourth_n);
}

// the output was

the sorted input array is : 7 12 32
the runtime is : 0.000013 s
the sorted input array is : 1 12 14 33 88
the runtime is : 0.000087 s
the sorted input array is : 1 3 8 12 15 23 33 88
the runtime is : 0.005481 s
the sorted input array is : 1 3 9 10 12 18 19 43 55 300
the runtime is : 19.696973 s
```

```
// HW1_Exercise2_2

#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>
#include <time.h>

bool is_sorted(int *a, int n)
{
	while ( --n >= 1){
		if (a[n] < a[n-1]) return false;
	}
	return true;
}

void shuffle(int *a, int n)
{
	int i, t, r;
	for(i=0; i<n; i++){
		t = a[i];
		r = rand()%n;
		a[i] = a[r];
		a[r] = t;
	}
}

void random_bogosort(int *a, int n)
{
	while (!is_sorted(a, n)) shuffle(a, n);
}

int doit(int *a, int n)
{
	clock_t start_t, end_t;
	int i;
	start_t = clock();
	random_bogosort(a, n);
	end_t = clock();
	double total_t = (double)(end_t - start_t);
	double timeinSeconds = total_t/ (double) CLOCKS_PER_SEC;
	printf("the sorted input array is : ");
	for (i=0; i<n; i++)printf("%d ", a[i]);
	printf("\n");
	printf("the runtime is : %f", timeinSeconds);
	printf("\n");
}
```

```
int main()
{
	int first_numbers[] = { 7, 32, 12};
	int first_n = 3;
	doit(first_numbers, first_n);
	int second_numbers[] = { 1, 33, 12, 14, 88};
	int second_n = 5;
	doit(second_numbers, second_n);
	int third_numbers[] = { 33, 1, 12, 3, 15, 88, 23, 8};
	int third_n = 8;
	doit(third_numbers, third_n);
	int fourth_numbers[] = { 12, 43, 55, 3, 1, 9, 19, 10, 300, 18};
	int fourth_n = 10;
	doit(fourth_numbers, fourth_n);
}

// the output was

the sorted input array is : 7 12 32
the runtime is : 0.000044 s
the sorted input array is : 1 12 14 33 88
the runtime is : 0.000032 s
the sorted input array is : 1 3 8 12 15 23 33 88
the runtime is : 0.006938 s
the sorted input array is : 1 3 9 10 12 18 19 43 55 300
the runtime is : 0.620617 s
```