Arrays and Pointers

Pointer examples

```c
#include <stdio.h>


int main(void)
{
        int i = 4, j = 6, *p = &i, *q = &j, *r;
        printf("p == &i : %d\n", (p == &i) );
        printf("**&p : %d\n", **&p);
        printf("*&p : %d\n", *&p);
        printf("&p : %d\n", &p);
        printf("p : %d\n", p);
        printf("p[0] : %d\n", p[0]);

        return 0;
}
```

Pointer examples

```
dccp_ta@sysprog1:~> gcc test.c
dccp_ta@sysprog1:~> ./a.out
p == &i : 1
**&p : 4
*&p : -1111462852
&p : -1111462864
p : -1111462852
p[0] : 4
dccp_ta@sysprog1:~>
```

Pointer examples

```c
#include <stdio.h>


int main(void)
{
        int arr[10] = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9};
        int x = 3;
        int * arr2 = arr+1;
        printf("%d\n", arr);
        printf("%d\n", arr2);
        printf("%d\n", arr2 - arr);
        printf("%d\n", *arr);
        printf("%d\n", *(arr + 3));
        printf("%d\n", arr2[2]);


        return 0;
}
```

Pointer examples

```
dccp_ta@sysprog1:~> !gcc
gcc test.c
dccp_ta@sysprog1:~> !./
./a.out
1160258192
1160258196
1
0
3
3
dccp_ta@sysprog1:~>
```

Pointer examples

```c
#include <stdio.h>

void swap1(char s1, char s2);
void swap2(char * s1, char * s2);
void swap3(char ** s1, char ** s2);
int main(void)
{
        char * str1 = "hello";
        char * str2 = "world";

        printf("%s %s\n", str1, str2);
        swap1(*str1, *str2);
        printf("%s %s\n", str1, str2);
        swap3(&str1, &str2);
        printf("%s %s\n", str1, str2);
        swap2(str1, str2);
        printf("%s %s\n", str1, str2);

        return 0;
}
```

```c
void swap1(char s1, char s2){
        char tmp;
        tmp = s1;
        s1 = s2;
        s2 = tmp;
}

void swap2(char * s1, char * s2){
        char tmp;
        tmp = *s1;
        *s1 = *s2;
        *s2 = tmp;
        return;
}

void swap3(char ** s1, char ** s2){
        char * tmp;
        tmp = *s1;
        *s1 = *s2;
        *s2 = tmp;
        return;
}
```

Exercise 1

- A program that reads a number of elements, stores them in an array, and computes the average and the standard deviation of the elements

```
#include <stdio.h>
#include <math.h>
int main(void)
{
    int n, i;
    double ab[100], avg, sd;

    printf("Enter n: ");
    scanf("%d", &n);
    printf("Enter n numbers: ");
    for (i=0; i<n; i++)
        scanf("%lf", &ab[i]);
    avg = 0;
    for (i=0; i<n; i++)
        avg += ab[i];
    avg /= n;
    sd = 0;
    for (i=0; i<n; i++)
        sd += (ab[i]-avg) * (ab[i]-avg);
    printf("Average: %f\nStandard deviation: %f\n",avg,sqrt(sd/n));
    return 0;
}
```

Exercise 2

- Write a program that decrypts the Shift Cypher (week 11, page 38)