Exercise 5 – Arrays, Functions

Due 28/1/99

Ex 1. (Median)

Write a program that asks the user for 15 integers, and then finds the median, i.e. the number with 7 numbers larger or equal to it and 7 smaller or equal to it.

Hint: you do not need to sort the numbers. (see ex. 2.)

***Ex 2. (Sorting) -- bonus**

Write a program that asks the user for 15 numbers, and then outputs them in increasing order.

Ex 3. (The Goldbach Conjecture)

A famous conjecture, called the Goldbach conjecture, says that every even integer greater than 2 has the property that it is the sum of two primes. Computers have been used extensively to test this conjecture. No counterexample has ever been found.

1. Write a function `int is_prime(int n)` that returns 1 if n is prime, and 0 otherwise.

2. Write a program that will prove that the conjecture is true for all integers between two values START and FINISH. For example, if you write

```
#define START 700
#define FINISH 1000
double sin(double x)
```

then the output of your program might look like this:

```
700 = 17 + 683
702 = 11 + 691
704 = 3 + 701
...
```

Ex 4. (Trig. Functions)

Implement the functions

```
double cos(double x)
double sin(double x)
```

using the Taylor expansion. (The implementation may use other functions, such as factorial, and power).

Write a program that checks that $\sin^2(x)+\cos^2(x)=1$ for various values of x.