



Programming 1 – 2014/15 Computer Practicum 4 – 01.12.2014

The answers should be handed in before 08.12.2013 on blackboard!

Write as a comment on the first line your name and student number:

```
/* <name> <student number> */  
#include <stdio.h>
```

Task 7 (3 points)

Write a program to sort a list of numbers. In Task 3 we already learned a simple algorithm to sort numbers. In the lecture, another method is described: *shellsort*. For your program, use *shellshort*.

The function `rand()` is defined by using `#include <stdlib.h>`.

`rand()` give a random value between 0 en `RAND_MAX`.

Generate a list of 50000 random and save them in a vector `x[50000]`. Sort this vector using the *shellshort* algorithm.

Task 8 (3 points)

Repeat task 3 and sort a list of 50000 random numbers using the simple algorithm from task 3.

Which algorithm is faster – the one from task 3 of task 7?

Explain why.

Tip: with the Linux command *time* you can measure the time it takes for a program to complete

Example:

```
> time ./Task8 measures the execution time of "Task8".
```

Write the answer to an ASCII file and upload this to blackboard.

Task 9 (3 points)

Write a program to calculate $\sin(x)$.

Use the function:

$$\sin(x) = \sum_{i=0}^{\infty} (-1)^i \frac{x^{2i+1}}{(2i+1)!}$$

The sum $\sum = y_0 + y_1 + y_2 + \dots y_i \dots$ is calculated using

$$y_0 = x \quad \text{en}$$

$$y_i = -x \cdot x \cdot y_{i-1} / (2i) / (2i+1) \quad , i = 1, 2, \dots$$

Repeat until $|y_i| < 10^{-3}$.

Calculate $\sin(x)$ for $x = 1$ en $x = 1.57$.

Use *scanf* to read the value of x .

Compare the result with the value of the standard function `sinf(x)`. This is a function from the math library (`#include <math.h>`).

Task 10 (3 points)

Calculate the number π using the random method which is explained below.

The surface of a quarter circle is $r^2 \cdot \pi/4$.

Calculate for n pairs (x,y) of random numbers between 0 and 1. Count the number in of pairs with

$$\sqrt{x \cdot x + y \cdot y} < 1.$$

π can then be calculated using

$$\pi \approx 4 \cdot in/n.$$

The random function `rand()` is defined by using `#include <stdlib.h>`.

`rand()/(float)RAND_MAX` give a random number between 0 en 1.

The square root function `sqrt(x)` is defined by using `#include <math.h>`.

Calculate π for $n = 100000000$.