Programmering for computerteknologi
Hand-in Assignment Exercises

Week 1: Programming, problem solving and reasoning

Please make sure to submit your solutions **by next Monday**.

In the beginning of each question, it is described what kind of answer that you are expected to submit. If *Text and code answer* is stated, then you need to submit BOTH some argumentation/description and some code; if just (*Text answer*) or (*Code answer*) then just some argumentation/description OR code. The final answer to the answers requiring text should be **one pdf document** with one answer for each text question (or text and code question).

Note: the **Challenge** exercises are *optional*, the others mandatory (i.e. you **have** to hand them in).

Exercises

(1) (Text answer) Consider the following program:

```c
#include <stdio.h>

int main (void) {
  int x, y;

  printf ("Input two numbers:\n");
  scanf ("%d%d", &x, &y);

  printf ("Input = (%d,%d)\n", x, y);

  x = x + y;
  y = x - y;
  x = x - y;

  printf ("output = (%d,%d)\n", x, y);

  return 0;
}
```

What is the program doing? Make at least four test runs of the program with different inputs. In your answer, note the input and output of the four test runs. Calculate the different values of x and y when the porgam executes and use that in the argumentation of why is it working (try also to make a general mathematical argument)?

(2) (Code and text answer) A program must solve the problem, but it should also be understandable for other programmers. Modify the program above so that is uses an extra variable (t) to store the x value temporary instead of the addition and subtraction.

In your answer, include a completed table using the input from table 1:

first number	second number	output
2	3	
3	2	
22	22	
-2147483648	-2147483648	
-2147483648	2147483647	
2147483647	2147483647	

Table 1: Test cases

(3) (Text answer) What is wrong with the following program?

```c
#include <stdio.h>
#define d3 1.609
int main(void){double d1,d2;printf("Enter the distance in miles> ");scanf
    ("%lf", &d1);d2=d3*d1;printf("That equals %f kilometers.\n", d2);
    return (0);
}
```

(4) (Text answer, Old exam question - solve it **without** running it, you will not be able to do so to the exam)
Let q, w, t be integer variables declared by

```c
int q;
int w;
int t;
```

Which assignment (a), (b), (c) or (d) inserted for the question mark in the program fragment below makes the following program fragment print out 4:

```c
  q = 2;
  w = 3;
  ?
  t = q + w;
  printf("%d", t);
```

Answer:

(a) w = q * w; ☐
(b) q = q * w; ☐
(c) w = q / w; ☐
(d) q = w / q; ☐

Tick the box on the right of the assignment to indicate by which assignment to replace the question mark in the program fragment. More than one expression may be correct.

Not part of the normal exam: Argue for why a given answer is correct or incorrect

(5) (Code answer) Write a program that computes the maximum of two integer numbers.

(6) (Code answer) Write a program that adds two numbers; write a program that adds three numbers; write a program that adds four numbers.

(7) **Challenge**: Write a program that computes the maximum number that can be produced by adding at most three arbitrary (possibly negative) integer numbers.