

## ASSIGNMENT (AFLEVERINGSOPGAVE) 1

### GENERAL INFORMATION

This assignment is made public on Friday, February 6th, 2004. The assignment is due on

Friday, February 13th, 1 PM.

Hand in your assignment to the teaching assistant running your lab session.

The first page of your (written) assignment has to contain at least the following information:

- the course name (Grundlæggende Programmering)
- name and student number of the fellow student(s) in your group (max two)
- assignment number

*Please staple your assignment!*

You will get back the graded assignment one week after submission deadline.

### WARM-UP AND SUGGESTIONS FOR FURTHER EXERCISES

As warm-up I suggest that you have a look at the review questions of Chapter 1 of the course book. As to further exercises I suggest the following from Chapter 12 of the textbook (pp. 12–13 of my copy):

- Exercises 1-3, 6, 7 are all suited as further simple exercises.

It is up to you whether or not you want to work on these exercises. Those exercises will not be marked.

## AFLEVERINGSOPGAVE: STØRSTE FÆLLES DIVISOR

Denne afleveringsopgave går ud på at skrive en algoritme, der givet to tal finder disses største fælles divisor (Greatest Common Divisor = GCD).

Har vi givet to positive heltal, fx 20 og 12, så er deres største fælles divisor 4, da det er det største positive heltal, der går op i både 20 og 12 uden divisionsrest. Det kan vi skrive på denne måde:

- $\text{GCD}(20,12) = 4$

Andre eksempler på GCD er

1.  $\text{GCD}(35, 15) = 5$
2.  $\text{GCD}(20, 15) = 5$
3.  $\text{GCD}(5, 15) = 5$
4.  $\text{GCD}(5, 10) = 5$
5.  $\text{GCD}(5, 5) = 5$
6.  $\text{GCD}(21, 7) = 7$
7.  $\text{GCD}(7, 21) = 7$
8.  $\text{GCD}(8, 17) = 1$

Bemærk her, at

- 1 altid er en fælles divisor, til tider endda den største, jvf eksempel 8.
- $\text{GCD}(X, X) = X$ , jvf eksempel 5
- $\text{GCD}(X, Y) = \text{GCD}(Y, X)$ , jvf eksempel 6 og 7
- $\text{GCD}(X, Y) = \text{GCD}(X-Y, Y)$ , jvf eksempel 1 - 5

Den sidste observation siger, at hvis et tal  $D$  går op i to andre tal  $X$  og  $Y$ , så går det også op i forskellen mellem dem. Det kan vi benytte os af i vores algoritme, idet vi hele tiden kan trække det mindste tal fra det største og så finde GCD herudfra. Skal vi fx finde GCD for 20 og 12 kan det se således ud:

$$\text{GCD}(20, 12) = \text{GCD}(20-12, 12) = \text{GCD}(8, 12) = \text{GCD}(8, 12-8) = \text{GCD}(8, 4) = \text{GCD}(8-4, 4) = \text{GCD}(4, 4) = 4$$

**Opgaven:** Skriv en algoritme, der givet to tal udregner deres største fælles divisor. Algoritmen skal skrives på dansk og altså hverken i Java eller andre programmeringssprog. Algoritmen skal skrives i samme stil som i forelæsningen.