RADBOUD UNIVERSITEIT NIJMEGEN
AFDELING STERRENKUNDE
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Programming 1 – 2015/16
Computer Practicum 5 – 07.12.2015

The answers should be handed in before 14.12.2015 on blackboard!

Write as a comment on the first line your name and student number:
/* <name> <student number> */
#include <stdio.h>

Taak 11 (3 punten)
The integral $I = \int_a^b f(x)dx$ can be calculated using the trapezium rule:

$$I = I_n = \frac{h}{2}\left(f(x_0) + 2f(x_1) + \ldots 2f(x_{n-1}) + f(x_n)\right)$$

for $i = 1 \ldots n$ with $h = \frac{b-a}{n}$ and $x_0 = a$ en $x_i = a + ih$.

Write a program that reads in n_0, k, a and b, and calculates the integral. The function $f(x)$ should be defined as "*function(x)*". Write the function "*integral(a,b,n)*" to calculate the integral for a given n.

Start with $n = n_0$ and raise n with k ($n+ = k$) until

$$\frac{|I_{n-k} - I_n|}{|I_n|} < 10^{-3}.$$

Calculate $\int_0^{10} \exp(x)$ for $n_0 = 10$ and $k = 5$.

The absolute value $|x|$ can be calculated using fabs(x) (#include<math.h>).

Taak 12 (2 punten)
Calculate the sum of all positive numbers in a vector. Apply this to:

```
int a[10]={-5, -128, 12, 36, 48, -55, 93, 508, -17, 7};
```

Use a FOR loop and the command CONTINUE.

Taak 13 (2 punten)
Remove all numbers from the end (only) of a character vector (string). Apply the algorithm to the following vector:

```
char text[]="We remove the number at the end of this string 1234567";
```

Use your own studentnumber. Use a FOR loop and the command BREAK.

Taak 14 (3 punten)
Primenumbers

Write a program to calculate the prime numbers. Read in the value for max using SCANF. Calculate the prime numbers between 1 and max.

Use the following algorithm:
Repeat a loop n from 2 until max.
  Use a second loop i starting from $n - 1$ and use ($i - -$) until $i = 1$.
    Stop the repetition if $n\%i == 0$. I.e. this means the number n can be divided through i.
    In this case n is not a prime number and we can stop.
    If $i == 1$, n is a primenumber.
      Print n.

Calculate the prime numbers between 2 and 500. Print 10 numbers per line.

Taak 15 (5 punten)
Write a function *char * i2roman(int n)* to convert an integer number to a roman number. Use the following convention to display the Roman numbers:

1	I
5	V
10	X
50	L
100	C
500	D
1000	M

There are never more than four identical Roman signs after each other. E.g. 4 is not IIII but IV, similarly 400 is not CCCC but CD.

The function *char *i2roman()* shall return a pointer to a string with the Roman number. Write a main program that reads the integer number via *scanf*, calls the function *i2roman*, and prints out the roman number with *printf*.

Remember to terminate the string internally with a \0.

For the following range of numbers, write out the decimal number and the romannumber, respectively:
1 - 50
499 - 501
999 - 1001