Computational Astrophysics I: Introduction and basic concepts

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Task 2.1 Declare and initialize variables

Write a short C++ program in where you *declare* a variable of type `int` (e.g, `int a ;`). Use `cout` to get the current value of this uninitialized variable.
Assign (=) the value 2147483647 to this variable and print out again the value of this variable.
Finally, add `+1` to this variable as follows:

```
a = a + 1 ;
```

and print out the value with `cout` once more.

Use the template for "Hello world!" from the lecture.

→ sample solution `declare_int.cpp`

Task 2.2 Input/output, integer division

Write a program that converts a time given in seconds into the format "hh:mm:ss".

→ sample solution `timeconversion.cpp`

Task 2.3 Simple `for`-loops

Use two *nested* `for`-loops and the command `cout` to print out/plot a triangle in the terminal (e.g., right-angled 10×10 characters):

```
XXXXXXXXXX
XXXXXXXX
XXXXXXX
XXXXXX
XXXXX
XXXX
XXX
XX
X
```

→ sample solution `triangle.cpp`

Task 2.4 Integer ranges

Check the range of integers of type `unsigned long` with help of a `for`-loop:

1. The `for`-loop in C/C++ looks like:

```
for ( int i = 2 ; i <= 10 ; ++i ) {
  ...
}
```

2. Declare a variable `longlimit` before the loop and assign the intial value 2 before the loop. Within the loop, multiply the factor 2 with every iteration.
3. For every iteration, print out the value of the loop variable (`i`), which is initialized with the value 2, and also `( longlimit - 1 )` using `cout`.
4. Iterate as long as necessary to reach the limit of `unsigned long`. What do you note? In this context, what is the meaning of `i`?
5. Repeat the test with the data type `long`. What happens if you iterate further over the limit?

→ sample solution `longlimit.cpp`