

## Informatik für Mathematiker und Physiker HS16

### Exercise Sheet 2

Submission deadline: 15:15 - Tuesday 4th October, 2016

#### Assignment 1 - Computations and Expressions (4 points) [Skript-Aufgaben 2, 3, 4, 18]

a) Fill in the following table! In the column **Valid?** fill in `true` or `false` depending on whether the expression is a valid C++ expression. Note that if an expression is not valid, the later columns cannot be filled in. In the column **L- or R-value?** fill in whether the *whole* expression is an L-value or an R-value. And in the column **Value?** fill in the (numerical) value of the expression.

	Expression	Valid?	L- or R-value?	Value?
(i)	<code>a=(b=5)</code>			
(ii)	<code>1=a</code>			
(iii)	<code>(a=5) * (b=7)</code>			
(iv)	<code>(a=b) * (b=5)</code>			

b) Compute the decimal values for the following numbers!

<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; border-right: 1px solid black; text-align: center;">binary</th> <th style="width: 50%; text-align: center;">decimal</th> </tr> </thead> <tbody> <tr> <td style="border-right: 1px solid black; text-align: center;">11</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; text-align: center;">110111</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; text-align: center;">11101001</td> <td></td> </tr> </tbody> </table>	binary	decimal	11		110111		11101001		<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; border-right: 1px solid black; text-align: center;">hexadecimal</th> <th style="width: 50%; text-align: center;">decimal</th> </tr> </thead> <tbody> <tr> <td style="border-right: 1px solid black; text-align: center;">11</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; text-align: center;">ff</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; text-align: center;">3e8</td> <td></td> </tr> </tbody> </table>	hexadecimal	decimal	11		ff		3e8	
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#### Assignment 2 - Temperature Conversion (4 points) [Skript-Aufgabe 22]

Write a program `celsius.cpp` that converts temperatures from degrees Fahrenheit into degrees Celsius. The formula is

$$^{\circ}C = (^{\circ}F - 32) \cdot \frac{5}{9}$$

You may for this exercise assume that the integer division rounds towards zero for all operands: for example,  $-5/2$  then rounds the exact result  $-2.5$  to  $-2$ .

The program should output the *correct* result in degrees Celsius as a mixed rational number of the form  $x \ y/9$  (meaning  $x + y/9$ ), where  $x, y \in \mathbb{Z}$  and  $|y| \leq 8$ . For example,  $13\frac{4}{9}$  could be output simply as `13 4/9`. We also allow for example the output `-1 -1/9` (meaning  $-1 - 1/9 = -10/9$ ).

### I/O-Examples

(Explanation: <http://lec.inf.ethz.ch/ifmp/2016/codeboard.html>)

0

0 degrees Fahrenheit are  $-17 \frac{-7}{9}$  degrees Celsius.

-100

-100 degrees Fahrenheit are  $-73 \frac{-3}{9}$  degrees Celsius.

**Submission:** <https://codeboard.ethz.ch/ifmp16E2T2>

## Assignment 3 - Average Speed (4 points)

[Skript-Aufgabe 21 (4 points)]

Suppose that someone drives from  $A$  to  $B$  at an average speed of 50 km/h. On the way back from  $B$  to  $A$ , there is a traffic jam, and the average speed is only 30 km/h. What is the average speed over the whole roundtrip?

When confronted with this question, many people would answer “40 km/h,” but this is wrong. Write a program that lets the user enter two average speeds in km/h ( $A \rightarrow B$  and  $B \rightarrow A$ ) and computes from this the average speed over the whole roundtrip ( $A \rightarrow B \rightarrow A$ ). Both inputs should be positive integers, and the output should be *rounded down* to the next smaller integer.

### I/O-Examples

(Explanation: <http://lec.inf.ethz.ch/ifmp/2016/codeboard.html>)

50

30

Average speed from A to B and back is 37 km/h.

75

75

Average speed from A to B and back is 75 km/h.

**Submission:** <https://codeboard.ethz.ch/ifmp16E2T3>

## Challenge - Bounds for Power Computations (8 points)

[Skript-Aufgabe 12 (8 points)]

**Note:** On some weeks we will add Challenge Exercises to the exercise sheet. Challenge Exercises are typically slightly more difficult than the normal exercises. If you have solved all of the regular exercises or if they are too easy for you, try the Challenges! However, since these are more difficult to correct, the teaching assistants don't have to correct them. But if you hand them in, you will get the sample solutions for them.