1 Assessment exercises week 1

1. Use the Celsius degree to Fahrenheit conversion formula $F = C \times 9/5 + 32$, where F is the temperature in Fahrenheit and C in Celsius degrees. Write a program that calculates the temperature value in Fahrenheit for 21° C and prints the result to screen.

2. Write a program that prints the text "Hello World" to the screen.

3. Write a progam that converts meters to the following British length units: inch, foot, yards and miles. Use that one inch is 2.54 cm, one foot is 12 inches, one yard is 3 foot and one mile is 1760 yards. Your program should calculate the requested values for a given length of 640 meters and print all four results to screen.

4. Compute the growth of money in a bank account. Let p be the interest rate in percent per year. An initial amount A has then grown to $B = A \times (1+p/100)^n$ after n years. Write a program for computing how much money £1000 have grown to after three years with 5% interest rate and print the result to screen.

5. Evaluate a Gaussian function. Write a program to calculate the function

$$f(x) = \frac{1}{\sqrt{2\,\pi}\,s}\,\exp\left[-\frac{1}{2}\left(\frac{x-m}{s}\right)^2\right]$$

   for a mean value m of zero, standard deviation s of 2 at a point $x = 1$ and print the result to screen. Note that the math module has the exponential function available as `math.exp()` and the square root as `math.sqrt()`.

6. The time in seconds it takes for the center of the yolk in an egg to reach the temperature T_y in Celsius is:

$$t = \frac{M^{2/3}\,c\,\rho^{1/3}}{K\,\pi^2(4\,\pi/3)^{2/3}}\ln\left[0.76\,\frac{T_0 - T_w}{T_y - T_w}\right]$$

   Calculate the time t for a large egg taken from the fridge ($T_0 = 4°$ C) and from room temperature ($T_0 = 20°$ C) for a yolk temperature to reach 70° C. Constant data for the formula is: $M = 67$ g, $\rho = 1.038$ g cm^{-3}, $c = 3.7$ Jg^{-1}K^{-1} and $K = 5.4 \times 10^{-3}$ W cm^{-1} K^{-1}. Boiling water temperature is $T_w = 100°$ C and $T_y = 70°$ C.

7. Write a program that defines the following variables with values as given: width=17, height=12.0 and delimiter='.'. Then print the following expression to screen: width/2, width/2.0, height/3, delimiter*5

8. Write a program that calculates the volume of a sphere with radius 5.

9. Write a program that calculates the emission line wavelength λ for the hydrogen atom according to the Rydberg formula

$$1/\lambda = R \times \left(\frac{1}{m^2} - \frac{1}{n^2}\right)$$

for the first two Lyman series emission lines using $m = 1$ and $n = 2$ and $n = 3$. The Rydberg constant is $1.097 * 10^{-2}$ nm^{-1}. Print the two wavelength numbers to screen in units of nano meters.

10. Write a program that calculates the time it takes for a ball at rest to drop from a height of 100 m to ground, ignoring air resistance. Print your result to screen. Assume the acceleration constant to be 9.81 ms^{-2}.