Assignment 1 (4 points)

Write a program `kdivisors.cpp` that inputs a natural number \( k \) and outputs a list of all numbers \( n \) between 1 and 1000 with exactly \( k \) divisors (including 1 and \( n \)).

Assignment 2 – Skript-Aufgabe 50 (4 points)

Write a program `dec2bin2.cpp` that inputs a natural number \( n \) and outputs the binary digits of \( n \) in the correct order. For example, for \( n = 2 \) the output is 10 and for \( n = 11 \) the output is 1011.

Hint: Find a way to “invert” the output of `dec2bin.cpp`.

Assignment 3 – Skript-Aufgabe 68 (4 points)

The number \( \pi \) can be defined through various infinite sums. Here are two of them.

\[
\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots \\
\frac{\pi}{2} = 1 + \frac{1}{3} + \frac{1}{3 \cdot 5} + \frac{1 \cdot 2 \cdot 3}{3 \cdot 5 \cdot 7} + \cdots
\]

Write a program for computing an approximation of \( \pi \), based on these formulas. Which formula is better for that purpose?

Assignment 4 - (4 points)

Mr. Plestudent studies Mathematics at ETH. Last year he developed a little smartphone-app that got quite successful. He expects to make \( m \) CHF net profit every year and decides to save all this money for holidays. He puts his earnings into a savings account that promises \( p\% \) interest every year. How much will he have at the end of his studies in \( n \) years?
Write a program `interest.cpp` that reads $m$, $n$ and $p$ from the standard input and outputs the amount of money that is in Mr. Plestudent’s account after he deposits $m$ CHF for $n$ years on the account with $p\%$ interest rate. Please note, that both $m$ and $p$ do not have to be integers (however, they are non-negative), $n$ is a positive integer.

The output of the program should look like this:

Yearly amount $m =$? 300
Yearly interest (in %) $p =$? 0.75
Number of years $n =$? 5
The total amount after 5 years is 1534.09 CHF.

**Challenge - Skript-Aufgabe 55**

The largest Mersenne prime known as of October 2013 is

$$2^{57,885,161} - 1$$

Write a program `famous_last_digits.cpp` that computes and outputs the last 10 decimal digits of the above Mersenne prime!