Introduction to Scientific Computing Examples

Using Loops

HINT: for some of the tasks, you may find the help of the mod operator (`%`) helpful. The mod operator returns the remainder when one number is divided by the other. For example `10%5=0` since they divide exactly, where `10%3=1` since 3 divides into 10 3 times with 1 remaining. Example code:

```c
#include<stdio.h>
int main() {
  int a=10, b1=5, b2=3;
  printf("%i mod %i = %i\n", a, b1, a%b1);
  printf("%i mod %i = %i\n", a, b2, a%b2);
  return(0);
}
```

Exercises

1. Calculate and print the decimal equaivalent of $\frac{1}{2}$, $\frac{1}{3}$, $\ldots$, $\frac{1}{10}$.
2. Ask the user to input a number. Ensure that they enter a positive number and if they do not, keep asking them until they do.
3. Ask the user to input a number. Ensure that they have entered a number that is divisible by 2 and if they do not, keep asking them until they do.
4. Calculate and print the Fibonacci numbers up until a user specified number has been reached. For example, if the user inputs 30, then the sequence will be 1, 1, 2, 3, 5, 8, 13, 21.
5. Calculate the following series up to a user specified value of n (this is the Maclaurin series for e):

$$1 + \sum_{i=1}^{n} \frac{1}{i!} \quad \left(= 1 + \frac{1}{1!} + \frac{1}{2!} + \cdots + \frac{1}{n!}\right) \tag{1}$$

6. Determine whether a user-input integer number is prime.
   HINT: a prime is only divisible by 1 and itself - the `%` operator may be useful
7. Calculate and print all of the prime numbers up to 100.