Sheet 2

Problem 1: *Diamond*

Write a program that prints the following diamond shape. You may use output statements that print either a single asterisk or a single blank. Maximize your use of repetition (with nested `for` structures) and minimize the number of output statements.

```
   *
  ***
 *****
*******
*********
*******
 *****
  ***
   *
```

Problem 2: *Factorial*

The factorial of a nonnegative integer n is written $n!$ (pronounced "n factorial") and is defined as follows:

$$n! = \begin{cases} n \cdot (n-1) \cdot (n-2) \cdot \ldots \cdot 1 & , n \geqslant 1 \\ 1 & , n = 0 \end{cases}$$

For example, $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$, which is 120.

a) Write a program that reads a nonnegative integer and computes and prints its factorial.

b) Write a program that estimates the value of the mathematical constant e by using the formula:

$$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \ldots.$$

c) Write a program that computes the value of e^x by using the formula:

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots.$$