Laboratory 1:

1. Use the escape characters in printing the following ASCII picture of a swan:



 Write a function of n and m that prints n white spaces followed by m asterisks. Then use this function and for loops to create the following ASCII art:

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2	Right - arrow		*
3. 4.	(Left - arrow) (homework) (Down - arrow) (homework)	*	* *
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- 3. Find all numbers $x \in \{1, ..., 1000\}$ and $y \in \{1, ..., 1000\}$ that satisfy the congruences $2x^2 + 3y^2 \equiv 5 \pmod{11}$, $x^3 + y^4 \equiv 2 \pmod{13}$, $x^2 y^2 \equiv 1 \pmod{17}$, $x^3 y^3 \equiv 1 \pmod{19}$
- 4. Write a function that generates the payment plan for a loan of a principal *P*, monthly payments *a*, and a monthly interest of *pr* percent. They function should print out an error message if the loan will never be repaid, which happens exactly if the first interest exceeds the monthly payment. The function prints out lines of numbers, where the first number is the month, the second is the interest payment, the third is the repayment, the fourth is the remaining principal.
- 5. Write a function that calculates the factorial $fact(k) = k! = 1 \cdot 2 \cdot 3 \cdot \ldots \cdot (k-1) \cdot k$.
- 6. Calculate the following approximations for π :

1. (Madhava)
$$\pi \approx \sqrt{12} \sum_{k=1}^{21} \frac{(-\frac{1}{3})^k}{2k+1}$$

2. (Ramanujan)
$$1/\pi \approx \frac{2\sqrt{2}}{9801} \sum_{k=0}^{21} \frac{-1)^k (6k)! (13591409 + 54514034k)}{(3k)! (k!)^3 640320^{3k+3/2}}$$

3. (Gregory Leibnitz) $\pi \approx 4 \sum_{n=0}^{1000} \frac{(-1)^n}{2n+1}$

Hint: The math module has a function factorial that calculates directly the factorial: e.g.: math.factorial(3*k).