Instructions:

★ All questions carry equal points (2 pt per question)

★ Write all your answers in a sheet of paper, which mentions your name, roll no and section, scan and upload them in the google form given.

★ For questions 8 and 10, write subjective answers and for all other questions you should draw the required flowcharts.

★ The TA’s for your class will grade every question according to the following scheme:

  0 - solution is incorrect

  1 - solution is partially correct

  2 - solution is completely correct

Duration: 3 days, Submit your answers in the google form by Monday (Dec 28th) 10:00 PM

1. Draw a flowchart that takes the attendance of three people as input (input will be 0 if they were absent and 1 if present) and displays whether all of them attended the class or not. Assume that the two values taken from input are always either 0 or 1.

2. Draw a flowchart that takes the score of a student as input and displays the grade of the student as follows
    - score >= 90 receives A+
    - 90 > score >= 80 receives A
    - 80 > score >= 70 receives B+
    - 70 > score >= 60 receives B
    - 60 > score >= 50 receives C+

  - 50 > score >= 40 receives C
  - score < 40 receives D

3. Draw a flowchart for finding the maximum of 4 numbers which are obtained as input from the user. Print “maximum value = <the maximum number>“ at the end.

4. Draw a flowchart that takes an integer, the year as input and displays “yes” if the year is a leap year and “no” otherwise. Note : Please refer Wikipedia for the exact criteria to determine if a given year is a leap year.

5. Draw a flowchart that takes the three angles of a triangle (in degrees) as input and prints whether the triangle is acute, right-angled, obtuse or invalid (i.e. a triangle with such angles does not exist). Assume that the 3 numbers obtained from input are **positive** real numbers.

6. Draw a flowchart that takes the perimeter and area of a rectangle as input and displays whether such a rectangle exists or not. Assume that the perimeter and area taken from input are **positive** real numbers. (Note: You should use only the operators that you have learned, i.e. +, -, *, /, //, **, **and**, **or**, **not** and **xor**, >,<,==).

7. Draw a flowchart for the color of light to be displayed at a traffic signal, by reading as input the current time t, the signal switching time s and transition time u. Assume that
   - The color at $t = 0$ is red
     (remains red from $t = 0$ to $s - 1$)

- After s seconds (i.e. at $t = s$) color changes to yellow
  (remains yellow from $t = s$ to $s + u - 1$)
- After another u seconds (i.e. at $t = s + u$) the color changes to green
  (remains green from $t = s + u$ to $2s + u - 1$)
- After another s seconds (i.e. at $t = 2s + u$) the color changes to yellow
  (remains yellow from $t = 2s + u$ to $2s + 2u - 1$)
- After another u seconds (i.e. at $t = 2s + 2u$) the color changes back to red, which is displayed for s seconds and the cycle continues
  (remains red from $t = 2s + 2u$ to $3s + 2u - 1$)

Note that red and green are displayed for s seconds, and yellow for u seconds.

Assume all input variables t, s, u are **positive integers**.
Print the color to be displayed at the end.

8. For any two positive integers x, y explain why there exists a unique pair of integers q, r which satisfies
   - $y = xq + r$
   - $0 \le r < x$

   Also show how to obtain the integers q, r from x, y using the operators that you have learned (+, -, *, /, //, **)

9. List down the values of the units digit of the first 10 powers of 3. In other words calculate $3^x \% 10$ for $x = 0, 1, ... 9$. Observe the pattern and draw a flowchart to calculate $3^x \% 10$, where x is any **non-negative integer** which is obtained as input.

10. Explain why the following statement is true (or provide a counterexample if it is false)

Statement: For any two positive integers x, y the value of $x \% y$ (i.e. the remainder when x is divided by y) is either equal to x or less than or equal to $x/2$