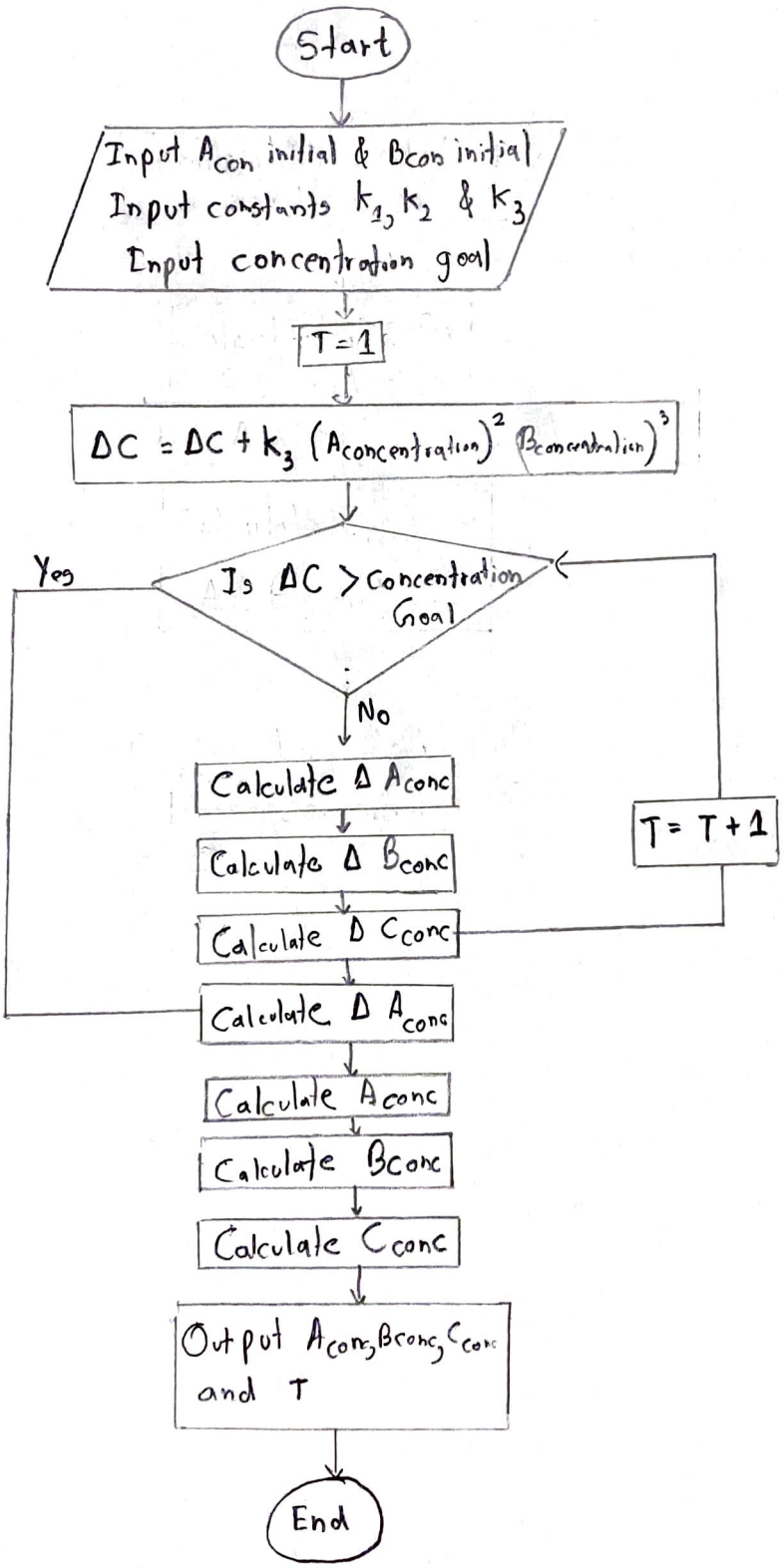
Problem Statement

Create a program that can determine the amount of time needed for chemical C to reach a specific concentration. The program must contain inputs for initial concentrations, and the 3 reaction constraints. It must display the number of minutes for each reaction to occur.

Diagram



Theory

Updated $\Delta A_{conc} = \Delta A_{conc} + 2k_1 (C_{Bi})^3$

Updated $\Delta B_{conc} = \Delta B_{conc} + 6 k_2 (C_{Ai})^2$

Updated $\Delta C_{conc} = \Delta C_{conc} + k_3 (C_{Ai})^2 (C_{Bi})^3$

$$C_A = \frac{1}{1/C_{Ai} + \Delta A_{conc}}$$

$$C_B = \frac{1}{1/C_{Bi} + \Delta B_{conc}}$$

$$C_C = 0 + \Delta C_{conc}$$

Assumptions

① Synthesis reaction has no contaminants
② The amount of chemicals A & B are exact.

Solution:

See file HW_6p1_Task1_gamagetd.vi

Verification:

Test case	Expected value	Actual value
$A_{conci} = 210$ $B_{conc_i} = 330$ $k_1 = 4.6\ E-5$ $k_2 = 3.44\ E-7$ $k_3 = 9.6E-13$	$C_A = 4.32\ E-6$ $C_B = 0.157$ $C_c = 106.5$ $T = 70$	$C_A = 4.32\ E-6$ $C_B = 0.157$ $C_c = 106.5$ $T = 70$

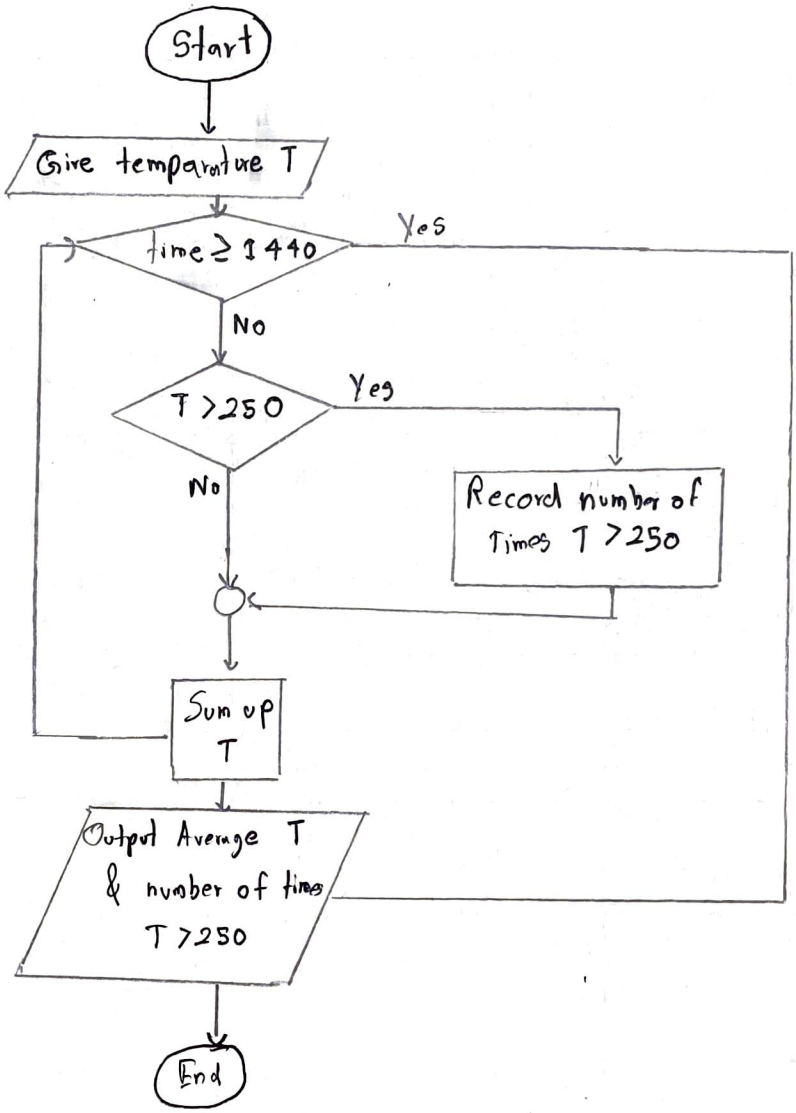
Conclusion

The program uses a while loop to calculate the overall change in concentration of the 3 chemicals, and then use the given equations to calculate the final concentrations.

Problem Statement

Write a program that output the average temperature for a day and the number of times the temperature exceeds 250°C during the day, given that the temperature is taken every minute.

Diagram



Theory

$T = (\text{Random number} \times 200) + 100$

Assumptions: Temperature can only be between 100 & 300.

Solution: see file HW_6p1_Task2_gamagetd.vi

Verification: Every time the program runs, the percentage that T exceeds 250 is about 25% of the time, and the average is always near the 200°C mark.

Conclusion: The program outputs the average temperature and the number of time T exceeds 250°C by taking the temp every minute using a for loop and tallying T, before dividing that total by 1440 minutes for the average.