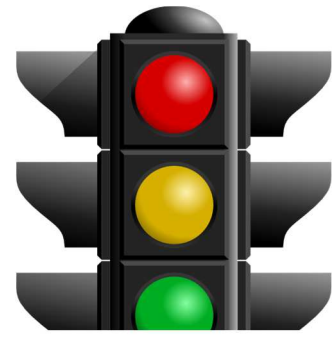


# COP 4365 – Spring 2022

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## Homework #4

### Title: Traffic Study

Well, good try. It turns out that the City of Smallville was not pleased with your last set of modifications to the traffic control system. The additional processing that is now required of each individual light has caused the processor in the light to start to overheat and there have been several cases of the light malfunctioning. The city has decided to revert to the solution that was used in homework #2 where the control logic is based in your main routine [Note: there will be no emergency vehicles in this homework].

The city has also noticed that they are starting to have some significant traffic delays associated with your light. When the Amazon warehouse at the Eastern edge of town changes shifts, there can be a significant backup of traffic. The city is interested in finding out how the timing of the lights can be changed to prevent traffic delays at different times of day.

The mayor's son was sent out to the intersection with a clipboard and a piece of paper in order to determine when cars arrived at the intersection from all four directions. He carefully wrote down what he saw and then went home and typed it into a file.

The city would like you to use the mayor's son's file to simulate the traffic pattern that happened on that day. They are interested in having you calculate several values:

1. How many cars came from each direction?
2. The maximum size of the line of cars that had to wait to get through the light.
3. How long each car had to wait to make it through the stoplight.
4. The average amount of time that cars wait based on which direction they are coming from (four values)

### **Create a traffic light control program that will do the following things:**

1. Add a class that will allow you to define car objects. Assign a sequence number variable, arrival time variable and an exit time variable to each car.
2. Read the data file which contains the direction that the car comes from and the time that it arrives at the intersection (e.g. "W103") and have cars arrive in sequence in each direction. The cars will be lined up waiting to get through the light while the light is yellow or red. Use a C# list variable to represent this line.

3. Cars will only pass through the intersection when the light is green. They will not enter the intersection when the light is yellow or red.
4. In this simulation, it takes one second for a car to pass through the intersection. Don't worry about where the car goes or if the car has to turn through oncoming traffic. Every car takes one second to pass through the intersection.
5. Run the program for 240 seconds. Print out a complete display of the current state of each light every time a light changes color and print the current time.
6. Print out a notification each time a car passes through the intersection: the car's sequence number, arrival time, exit time, and total time waiting.
7. Run the system until you reach the 240 second mark and then terminate the program.
8. Once the simulation is complete, print out:
  - a. How many cars came from each direction?
  - b. The maximum size of the line of cars that had to wait to get through the light.
  - c. The average amount of time that cars wait based on which direction they are coming from (four values)

**Notes:**

- You are only permitted to use the C# commands that we have covered in class so far. Yes, there are many more, but no, you can't use them in solving this homework!
- You must use a class in your solution.
- You must declare at least 5 objects in your solution: four objects for your traffic lights and an object for each car in the system.
- Do not hardcode the traffic sequences. Assume no knowledge of the content of the data file. When writing code use LOGIC to solve the problem.

**→ Homework Assignment: Turn in a listing of your program and output based on running for the specified time as a part of this assignment.**

## Assignment Requirements:

1. You are required to turn in a printout of (1) a listing of your C# program and (2) a printout of the results of running your program for the specified amount of time. **You also have to submit an electronic copy of your homework via Canvas.**

Your code must contain the following comment header:

```
//  
// COP 4365 – Spring 2022  
//  
// Homework #4: Traffic Study  
//  
// Description:  
//  
// File name:  
//  
// By: (Your Name)  
//  
//
```

2. **This homework is due at the start of class on Tuesday, 04/26/22.**