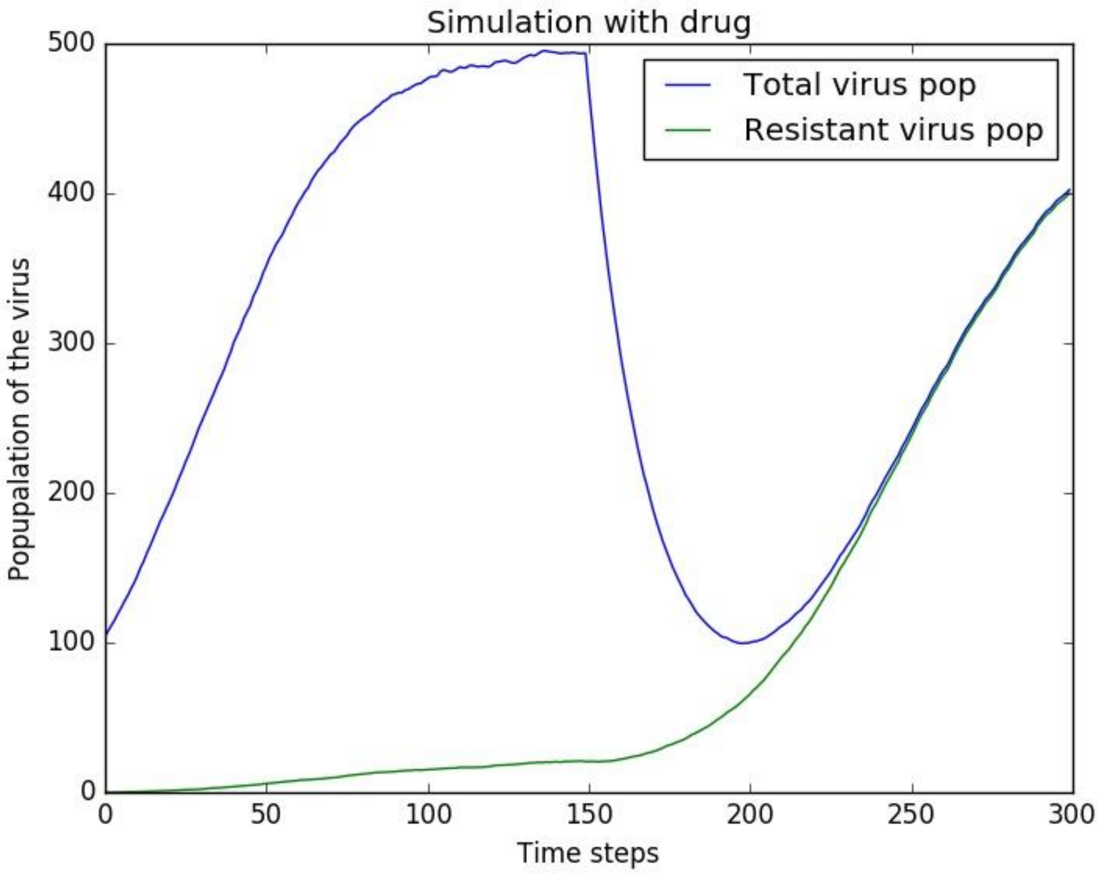
Problem 2: simulation with drug

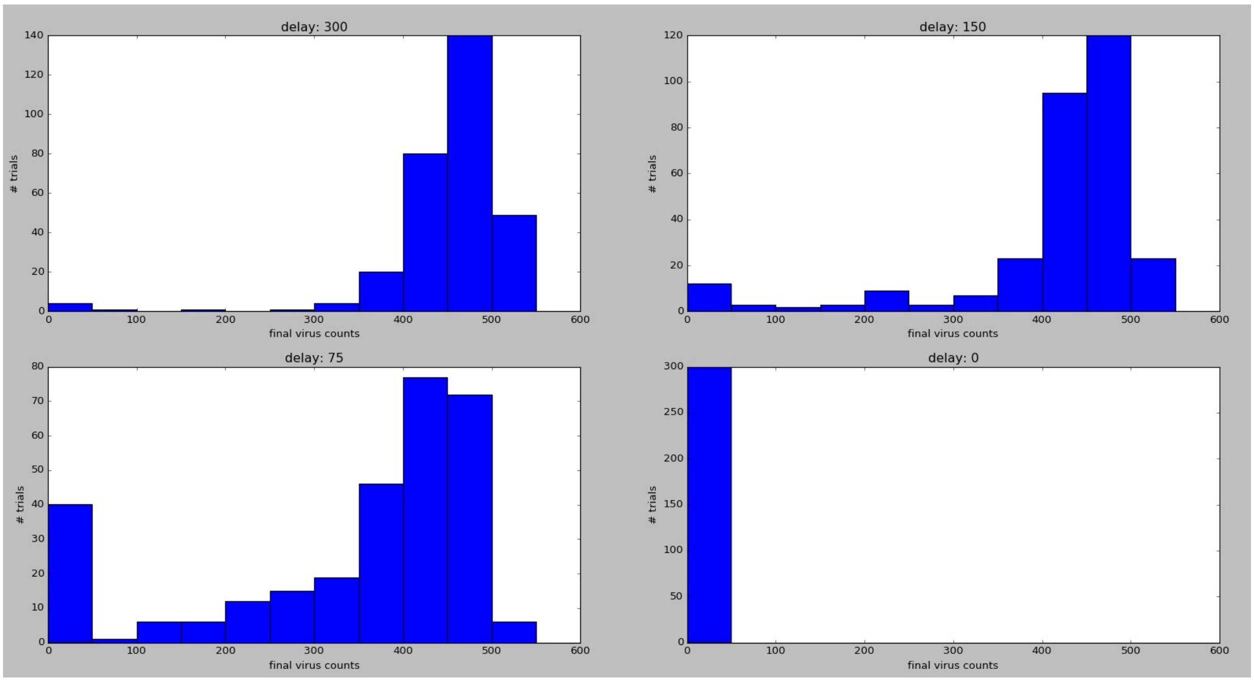
Graph for 100 trials



– What trends do you observe? Are the trends consistent with your intuition?
Total virus population dropped after introduction of drug. And then rebounded, but only resistant viruses survived.

Problem 3: simulations with different delays of drug prescription

Histograms for 300 trials



– If you consider final virus particle counts of 0-50 to be cured (or in remission), what percentage of patients were cured (or in remission) at the end of the simulation? What is the relationship between the number of patients cured (or in remission) and the delay in treatment? Explain how this relationship arises from the model.

I can justify that 300 trials were enough, because the curve doesn't change much if I run the simulation multiple times. And this trend is visible around this number of trials.

The patients with final virus count of 0-50 can be considered cured.

The percentage of cured patients:

for 300 time/step delay: 4 / 300 = 1.3%

for 150: 12 / 300 = 3%

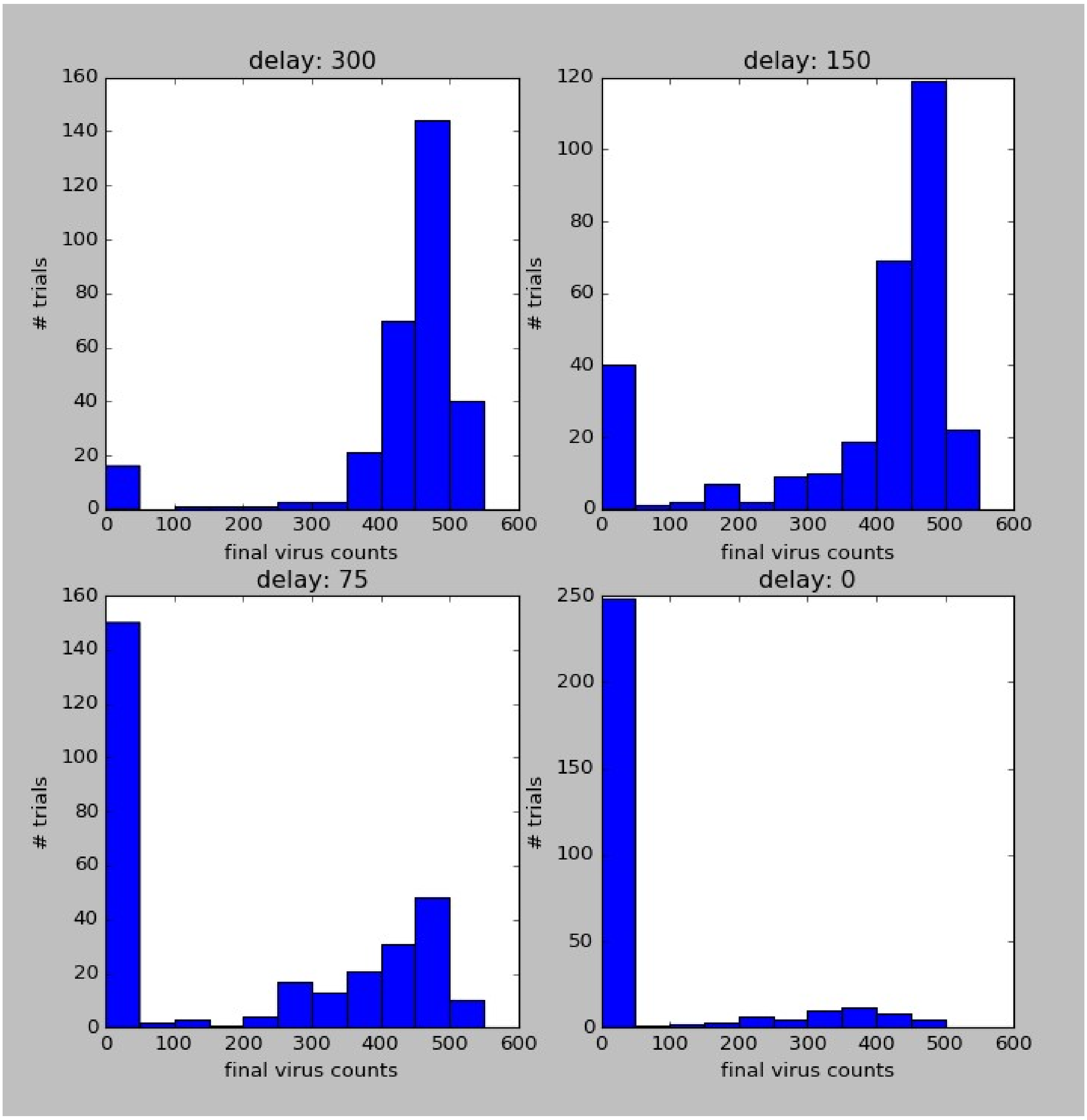
for 75: 40 / 300 13.3%

for 0: 100%.

I can make conclusion, that the less we delay the prescription of the drug – the higher the chance that patients will be cured.

Problem 4: simulations with two drugs

Graphs for 300 trials



– What percentage of patients were cured (or in remission) at the end of the simulation? What is the relationship between the number of patients cured (or in remission) and the time between administering the two drugs?

Percentage of patients cured:

300 t/s delay: 18 / 300 = 6%

150 t/s delay: 40 / 300 = 13.3%

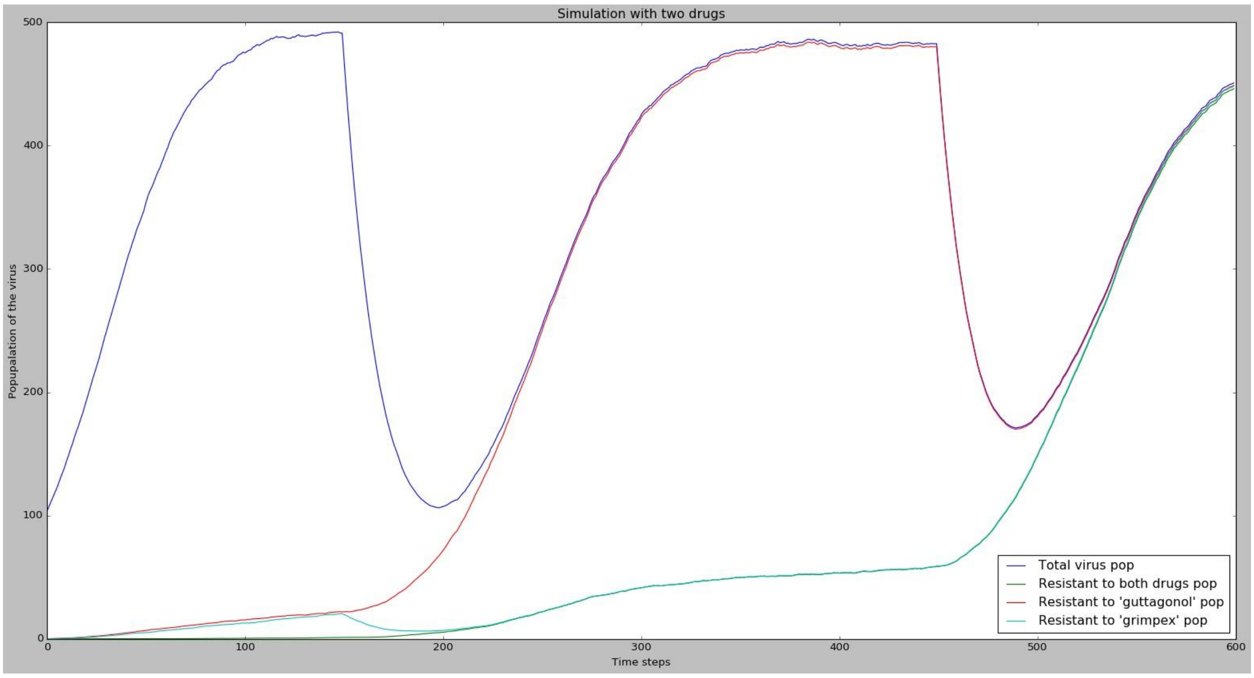
75 t/s delay: 150 / 300 = 50%

0 t/s delay: 250 / 300 = 83.3%

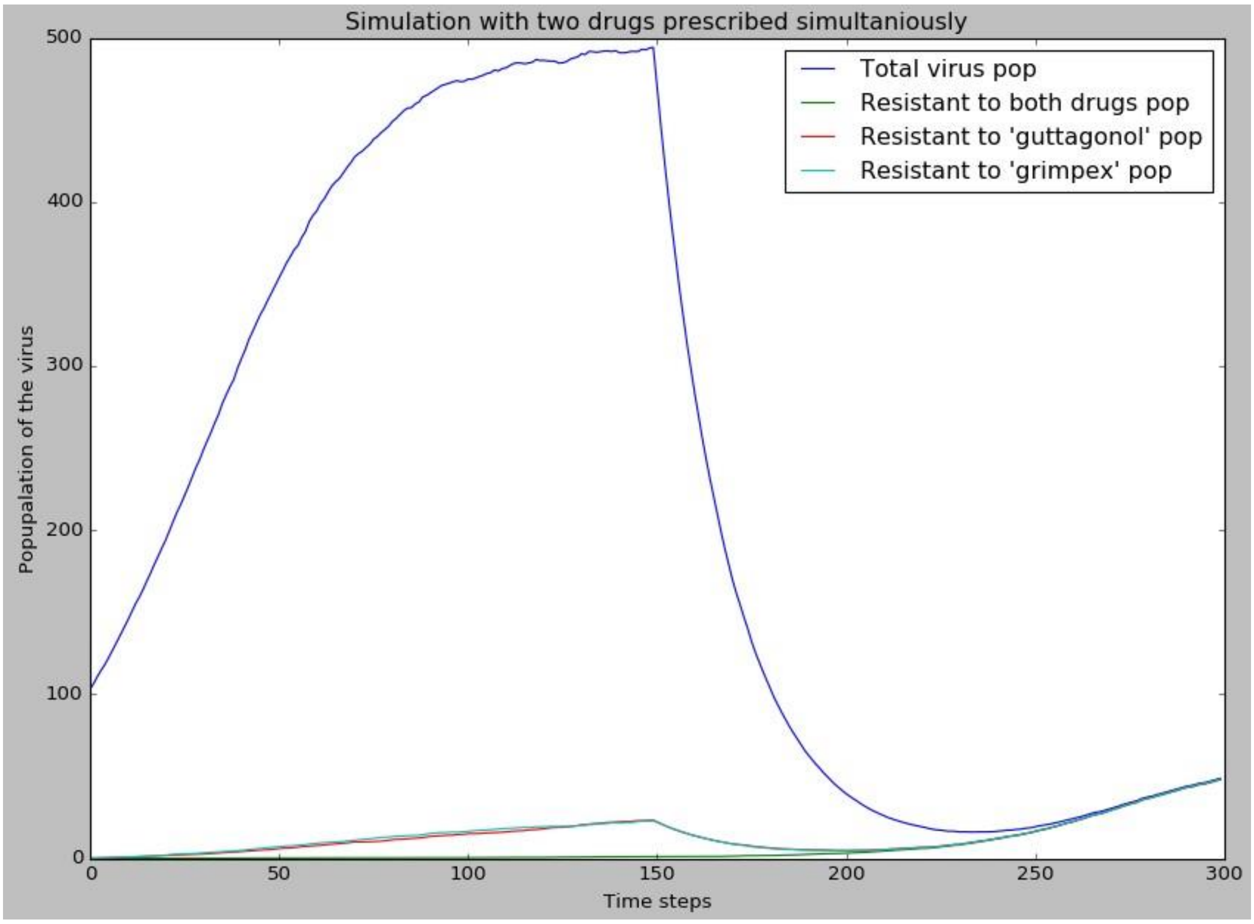
As in previous simulation, the less the delay – the higher the chance of curing the patient

Problem 5

Graph for 100 trials of simulation with two drugs prescribed separately



Graph for 100 trials of simulation with two drugs prescribed simultaneously



– explain the relationship between the patient outcome and the time between administering the two drugs arises.

The first graph shows that after prescribing one drug at a time, the virus population rebounds each time.

But if we prescribe both drugs simultaneously, the result is much more effective.

Problem 6: Patient Non-compliance

– A very common problem is that a patient may not consistently take the drugs they are prescribed. They can sometimes forget or refuse to take their drugs. Describe how you would model such effects.

To model patient's non-compliance, I would add an attribute to Patient class – probability of the patient taking a drug. And modify addPrescriptions() method, including this probability.