Description of Simulated Process

1. Arrival:
   1. 10min registration period
   2. 10 slots per period
   3. x% full for different periods, in other words, binomial distribution with n = 10 and p = x%\*
      1. 8:00-11:30: inter arrival time mean = 2min, pct = 50%
      2. 11:30-3:00: inter arrival time mean = 1.43min, pct = 70%
      3. 3:00-6:30: inter arrival time mean = 1.11min, pct = 90%
   4. Uniform distribution between [-10 10] min of scheduled time.
   5. Assume infinite queue capacity after arrival (can always wait outside the arena)
2. TSA, temp check, and paperwork
   1. Finish while waiting in queue for registration
   2. Time spent is uniform [1, 2]
   3. Capacity of the arena is considered - cannot start paperwork if queue for registration is full.
   4. Queue capacity = 30
3. Registration
   1. 4 stations baseline, time is exponential with mean = 4min, station number is a parameter
   2. Cannot start registration when registration server is full, or when queue waiting for vaccine is full (5 people)
4. Vaccination Recording Process
   1. vaccination and recording start at the same time at the same station, performed by 2 staff
   2. Vaccination is negative exponential with mean rate of 1 per 3 minutes.
   3. Recording is uniform [2,4]
   4. 5 stations baseline, station number is a parameter
   5. cannot begin vaccination if observation area is full (60 people)
5. Observation
   1. Starts after both vaccination and recording stops
   2. 15 min for all
   3. capacity = 60
6. Simulation Setup
   1. Vaccination slots available/staff work 8:00am – 6:30pm for 2 days
   2. staff will stay until all scheduled vaccination is completed.
   3. All time stamp rounded to the nearest minute, i.e. Δt = 1min.
   4. Vaccination station number [1 6], registration server number [1 6] is simulation. In other words, there must be at least 1 open station, and no more than 6 stations because of limited resources.
   5. Simulation is ran for 3.5hr (210min) for 5 times.

\*Arrival rate calculation

46.25% in NH unvaccinated, assume 20% in Dartmouth unvaccinated

Left 1300 people unvaccinated at Dartmouth, assume 70% will come, this means around 43 people per hour should arrive on average. This corresponds to 43/60~=70% of the slots will be filled.

Variables and Outputs

* Time arrays: each array has the length of number of patients in each simulation, for example, tArrivalArr(n) is the arrival time of the nth patient.
  + tArrivalArr: arrival time
  + tTSABgnArr: time when begin TSA, temperature test and paperwork
  + tTSACmpltArr: time when complete TSA, temperature test and paperwork
  + tRegBgnArr: time when begin registration
  + tRegCmpltArr: time when finish registration
  + tVaccBgnArr: time when begin vaccination
  + tVaccCmpltArr: time when finish registration
  + tsfArr: time when finish entire process, after observation.
  + The time arrays were exported into a csv file, with each row representing each element above, by that order
* Number of people in each state: each array has length of simulated time, in munutes, records how many people are in each state every minuts
  + NregqArr: number of people staying in the queue for registration – between tTSABgn and tRegBgn
  + NregArr: number of people being registered – between tRegBgn and tRegCmplt
  + NvaccqArr: number of people in the queue for vaccination – tRegCmplt and tVaccBgn
  + NvaccArr: number of people getting vaccinated/recorded – between tVaccBgn and tVaccCmplt
  + NobserArr: number of people being observed – between tVaccCmplt and tsf
  + The N arrays were exported into a csv file, with each row representing each element above, by that order