

The top-notch burger joint

(by Thilo Gross)

I would like to open a top-notch burger joint. A really nice expensive restaurant, but only for burgers. If you tried my burgers, you would understand. Of course this quality cannot be mass produced, so it will have to be a small place.

I might actually need your help to figure out how small. Please estimate the number of burgers that I can prepare myself within an hour.

Given the number of burgers that I can make, what is the approximate number of customers that I can serve in an evening?

What I really want to know is, given the number of customers, how much space do I need to rent to seat all the customers on tables such that there is still enough space left that they can actually get to the tables.

Solution

This is a challenge in 3 parts with increasing difficulty. In the first part we are asked how many burgers the owner of the fictional burger joint can prepare in 1 hour. As in almost every modeling question there is no crystal clear answer. An individual burger might need as much as 15 min from start to finish, but while the patty is being cooked we can put other burgers together. Thus we can probably finish a burger every other minute, which equates to a production of 30 burgers per hour.

In the second part we are asked how many customers we can service in an evening. Lets assume that we make 30 burgers per hour and realistically we are going to have customers between 6pm and 10pm that would mean that we can feed 120 customers.

The third part asks about the seating. The first difficulty here is that we have to ask how many customers we will be in the restaurant during peak time as my 120 customers are unlikely to all hang around in the restaurant all evening. We know that we can feed 30 customers per hour, if we assume that the average customer spends two hours in the restaurant we can expect to have about 60 customers in the restaurant at the same time.

How much space do I need to seat 60 people? Let's try to work out how much space we need at least. Its not unreasonable that a person sitting on a chair with some table space needs approximately $60\text{cm} \times 60\text{cm}$, which is 0.36m^2 . So we could actually seat 60 people on 21.6m^2 . But we haven't allowed for corridor space so far. One can now have fun exploring various geometries of the restaurant. Probably the most economic one is one long corridor with tables on either side. There are now 30 people sitting on each side of the corridor, each of whom needs 60cm space so the corridor needs to be 18m long. If it a meter wide that adds 18m^2 . Hence we may be able to get away with 39.6m^2 . Considering more comfortable geometries with a little bit more space would result in a larger restaurant, but probably not more than twice as large.

Make sure that students use an estimate, instead of just guessing the answers. See whether they realized that not all customers are in the restaurant at the same time.