

MTH6157 Survival Models

Questions – Week 2 – Survival Model concepts

1. Show that if the force of mortality is a constant between ages x and $x+1$ then the central rate of mortality at age x is equal to the force of mortality.
2. A reality TV show runs for 5 consecutive days with some of the contestants leaving the show at the end of each day. The table below shows the probability of leaving on a particular day for contestants on the show at the beginning of that day. Calculate the expectation of reality TV life at the beginning of the show.

Day	1	2	3	4	5
Probability	0.25	0.46	0.64	0.85	1

3.
 - a. Write down the Gompertz Law formula for the force of mortality at age x in terms of two parameters B and c .
 - b. The following is an extract from a mortality table which follows the Gompertz Law. Find B and c .

Age x	μ_x
45	0.0046
46	0.0048

4. A city starts a new bicycle hire scheme and takes delivery of 64,000 new bikes from a manufacturer. When bikes stop working for any reason they are not repaired but just returned to the manufacturer at the end of the day. The manufacturer believes that the working lifetime of its bikes follows an exponential model. 24 bikes are returned to the manufacturer at the end of the first day (and not replaced in the hire scheme). Estimate the probability that a new bike will still be in the hire scheme and working after a year.
5. Which is larger q_{70} or m_{70} ? Why?