

MTH5125 Assessment 1

Deadline: March 15 at 5:00PM on QMPlus

Please submit two files

- one Excel file
- one written file with your detailed answers.

1. The population of City of London follows Makeham Survival Model with $A = 0.00019$, $B = 0.0000029$ and $C = 1.132$.

Construct a life table for (x) taking values from 20 to 115, using Excel. Interest rate is 0.04 per annum.

Make sure you derive p_x , q_x , \ddot{a}_x , A_x , ${}_{10}E_x$, $\ddot{a}_{x:\overline{10}}$.

Please explain the meaning of these expressions and write down all the formulae used in the Excel file. [25 marks]

Hint: ${}_{10}E_x = v^{10} {}_{10}p_x$

2. A life office issues a whole life insurance to Shawn Alvarez aged 30, with sum insured £100,000 (payable at the end of the year of death).

Premiums are payable annually in advance for 10 years, or until earlier death. Commission is 20% of first year premium, and 5% of all premiums after.

Find the gross annual premium that Mr. Alvarez needs to pay for his policy using the lifetable found at question 1. [25 marks]

3. Calculate the gross premium policy value (reserves) at time $t = 3$ for Mr. Alvarez's policy. The policy basis is the same as premium basis. [15 marks]

4. Calculate the net premium policy value at time $t = 3$, using the same policy basis (the same survival model) **but** with $i = 0.02$ per annum. Hint - make sure you calculate the net premium under this policy basis first and then calculate the reserves. [25 marks]

5. Explain why your answers found above (question 3 and question 4) are different. (WCA) [10 marks]