MDA INTERNAL 2025

1. Read the background document, which describes the scenarios that need to be modelled and documented for this project.
2. Construct a spreadsheet model that produces the following calculations and charts. You should ensure that your spreadsheet contains appropriate **self-checks** and that you have performed robust **reasonableness checks** at each stage of your calculations.
   i) Complete the data set for the mortality rates for the missing breeds based on the clarification provided and perform any checks, reasonableness checks and amendments [You have been provided with a spreadsheet which contains the data as mentioned in the background.]
   ii) Calculate the expectation of life from birth for each of the three dog breeds, ignoring the mortality improvements.
   iii) Recalculate the three expectations of life from birth under the reduced mortality rates assumption. However, as Lekali forgot to mention whether the improvement their product provides is on a simple or a compounding basis, please do so on both basis such that the client can choose the one they need to present to the client.
   iv) Calculate the simple percentage change in mortality rates that would result in an expectation of life from birth for the Rottweiler such that it is equal to that of the Doberman on compounding increase of 5% rounded to the nearest full year.
   v) Produce charts for comparing the base mortality rates for all 3 breeds, expectations of life on simple and compound improvement basis for all 3 breeds.

Marks available for spreadsheet model and checks:

Accurate completion of above modelling steps	[27]
Demonstration of good modelling technique and practice	[5]
Other self and reasonableness checks	[3]
	[Sub-total 35]

1. Produce an audit trail for your spreadsheet model which includes the following:

- purpose of the model
- data and assumptions used
- methodology, i.e., description of how each calculation stage in the model has been produced
- explanation of any checks performed
- **explanation of charts in details**

Both senior actuaries and your colleagues should be able to peer review your work in your absence or independently.

Marks available for audit trail:

Audit approach

Fellow student can review and check methods used in the model	[10]
Senior actuary can scrutinise and understand what has been done	[10]
Written in clear English	[5]
Written in a logical order	[5]

Audit content

All steps clearly explained	[8]
Clear signposting included throughout	[7]
Statement of assumptions made	[5]
All model steps accurately covered	[15]

[Sub-total 65]

Background

In India there are three popular breeds of dog which support the Indian Defence forces i.e. the German Shephard, Doberman, and Rottweilers which are all breeds from other countries. Lekali Dog Chew is a producer of dog food which uses Yalk organic milk in their products and which is appropriate for dogs of age 2 and above.

Lekali Dog chew claims that their brand of dog food specialises in dog food for foreign originated breeds and improves longevity by getting dogs acquainted with the environment faster, reducing mortality rates by 5% per annum throughout life, from age 2 onwards.

You are an actuarial student working for IAQS consultancy. Lekali Dog chew owner is friends with your academics director and has approached him, a qualified actuary, and asked him for help in performing calculations to show what impact the reduced mortality rates will have on the expectations of life of pet dogs. As the Rottweilers account for 65% of dogs supporting the defence forces, Lekali dog chew has also asked what percentage change on simple improvement basis in mortality rates would be needed in order for that breed of dog to have an expectation of life from birth equal to the life expectation of life from birth for the Doberman (based on revised

5% compounding increase in longevity found in the previous scenario) rounded to the nearest full year.

In order to meet the client's requests, your boss obtained mortality rates from PETA, for male dogs of each breed and for each age exact. However, while transferring the data, the rates for Doberman and Rottweilers got erased erroneously. However, on clarification, you were told that the rates of Doberman are 25% higher and of rottweilers are 32% higher than that of the German Shephard. You have been asked to complete the data set and perform data checks before proceeding.

Additional information: Expectation of life

The expectation of life from age x can be calculated as:

$$e_x = \sum_{t=1}^{\infty} {}_t p_x$$

where ${}_t p_x$ is the cumulative probability of survivorship from age x to age $x + t$, which can be calculated as:

$${}_t p_x = p_x \times p_{x+1} \times p_{x+2} \times \ldots \times p_{x+t-1}$$