1. Suppose that the survival function is given by

$$s(x) = \frac{100 - x}{100}$$

Compute ${}_{10|19}q_{31}$

- a. $\frac{19}{69}$
- b. $\frac{6}{23}$
- c. $\frac{20}{69}$
- d. $\frac{17}{69}$
- e. $\frac{7}{23}$
- Unanswered

The time is 8:55

2. For a given life age 24, it is estimated that an impact of a medical breakthrough will be an increase of 2 years in $\mathring{e}_{24}$, the complete expectation of life. Prior to the medical breakthrough, $s(x)$ followed de Moivres law with $\omega = 99$ as the limiting age. Assuming de Moivres law still applies after the medical breakthrough, calculate the new limiting age ω'.

- a. 101
- b. 105
- c. 100
- d. 106
- e. 103
- Unanswered

The time is 8:55

3. Suppose

$$s(x) = \begin{cases} 1 & \text{for } 0 \le x \le 1 \\ 1 - \dfrac{e^x}{100} & \text{for } 1 \le x \le 4.632 \\ 0 & \text{for } 4.632 \le x \end{cases}$$

Compute $\mu(3.1)$.

- a. 0.33
- b. 0.24
- c. 0.29
- d. 0.35
- e. 0.22
- Unanswered

The time is 8:55

---

4. Suppose that

$$\mu(x) = \frac{4}{97 - x}, \quad 0 \le x \le 97$$

Calculate the future median life of (20).

- a. 9.28
- b. 11.97
- c. 12.94
- d. 12.25
- e. 12.97
- Unanswered

The time is 8:55

---

5. Suppose that $\mu_x = 0.01$ and that the force of interest is $\delta = 0.04$.
An insurance pays 11 units at the time of death. Find the variance of the present value of

the benefit for a 7-year deferred whole life policy.

- a. 4.1774
- b. 4.7569
- c. 5.7137
- d. 4.9586
- e. 4.1727
- Unanswered

The time is 8:55

---

6. Suppose that $\mu = 0.215$ and that the force of interest is $\delta = 0.528$. For an individual of age (x), compute $(\overline{IA})^{1}_{x:\overline{5}|}$.

- a. 0.3786
- b. 0.3120
- c. 0.3477
- d. 0.3447
- e. 0.2981
- Unanswered

The time is 8:55

---

7. For an insurance of 1000 on (54), you are given:

1. $p_{65} = 0.95$
2. $v = 0.94$
3. $1000 \ {}_{12}V_{54} = 266$

Compute $\text{Var}[\Lambda_{11}|K(54) \geq 11]$.

- a. 22,512
- b. 22,212
- c. 23,012

- d. 22,112
- e. 22,612
- Unanswered

The time is 8:55

---

8. For a special whole life insurance on (x), you are given:

(i) $\mu_{x+t} = \mu, \quad t \geq 0$
(ii) $\delta_t = \mu, \quad t \geq 0$
(iii) the death benefit, payable at the moment of death is 1 for the first 10 years and $\frac{1}{2}$ thereafter
(iv) the actuarial present value at issue of the insurance is 0.3483
(iv) Z is the present-value random variable at issue of the death benefit

Calculate $V(Z)$.

- a. 0.0687
- b. 0.0403
- c. 0.0939
- d. 0.1164
- e. 0.0716
- Unanswered

The time is 8:55

---

9. You are given:

(i) $s(x) = 1 - \frac{x}{98}, \quad 0 \leq x \leq 98$
(ii) $\delta = 0.06$

Calculate $\bar{a}_{32}$.

- a. 12.54
- b. 13.22

- c. 13.48
- d. 11.82
- e. 12.16
- Unanswered

The time is 8:55

---

10. In this problem, we use the illustrative life table at 6% .
Find the variance of a whole life annuity-due to be paid for a life age 34.

- a. 5.477
- b. 5.991
- c. 6.020
- d. 6.245
- e. 6.370
- Unanswered

The time is 8:55

---

11. For a continuous life annuity of 1 on (x), you are given:

(i) The force of mortality and force od interest are constant and equal.
(ii) $\bar{a}_x = 12.3$.

Calculate the standard deviation of $\bar{a}_{\overline{T(x)|}}$.

- a. 6.51
- b. 7.06
- c. 6.95
- d. 8.59
- e. 5.53
- Unanswered

The time is 8:55

---

12. You are given:

(ii) Mortality follows the illustrative life table at 6%.
Click here to see the table in a different window
(ii) Assume UDD over each year of age.

Compute the variance of the loss of whole life policy on a life aged (35) that pays 60,000 at the moment of death.

- a. 93,039,200
- b. 92,699,200
- c. 92,969,200
- d. 92,889,200
- e. 92,959,200
- Unanswered

The time is 8:55

---

13. Your age is 26 and you want to buy a three-year term life policy with a benefit of 50,000 payable at the end of year of death. Suppose that $i = 0.07$ and
$p_{26} = 0.96, \quad p_{27} = 0.94, \quad p_{28} = 0.91, \; p_{29} = 0.88.$
Find the equivalence premium of this insurance.

- a. 2,867
- b. 2,679
- c. 2,709
- d. 2,744
- e. 3,041
- Unanswered

The time is 8:55

---

14. Your age is 31 and you want to buy a 4-year term life policy with a benefit of 150,000 payable at the end of year of death. Suppose that $i = 0.05$ and
$p_{31} = 0.94, \quad p_{32} = 0.92, \quad p_{33} = 0.89, \; p_{34} = 0.86.$
Find the equivalence premium of this insurance.

- a. 13,182
- b. 13,421
- c. 13,283
- d. 13,086
- e. 13,156
- Unanswered

The time is 8:55

---

15. The distribution of future life time of (x) is as follows:

(i) With probabiliy 0.53, the future lifetime of (x) follows the illustrative life table at 6 % with UDD over each year of age.
Click here to see the table in a different window

(ii) With probabiliy 0.47, the future lifetime of (x) follows a constant force of mortality $\mu = 0.03$ and $i = .06$.

A fully continuous life insurance of 2000 issued to (55). Find the benefit premium for this insurance.

- a. 56.44
- b. 64.26
- c. 51.02
- d. 66.42
- e. 63.58
- Unanswered

The time is 8:55

---

16. A whole life contract issued to (24). You are given:

(i) Mortality follows the illustrative life table at 6%.
Click here to see the table in a different window
(ii) The face amount is to be one for the first 8 years and two thereafter.
(iii) Premiums are payable at the beginning of the year with π payable each of the first 8 years and 2π payable in each year thereafter up to age 66.
(iv) Claims are paid at the end of the year of death.

Compute π using the equivalence principle.

- a. 0.0055691
- b. 0.0054790
- c. 0.0056606
- d. 0.0059722
- e. 0.0062327
- Unanswered

The time is 8:55

---

17. For a fully discrete 18-year endowment insurance of 100,000 on (40), you are given that mortality rate follows the illustrative life table at 6%.
Click here to see the table in a different window .
Compute the premium at issue using the equivalence principle.

- a. 3,332
- b. 3,337
- c. 3,352
- d. 3,307
- e. 3,312
- Unanswered

The time is 8:55

---

18. For a fully discrete whole life insurance of 2000 on 42, the contract premium is the level annual benefit premium based on the mortality rates at issue. At time 10, the actuary decided to change the mortality rates for ages 52 and higher.
You are given:

(i) $d = 0.04$
(ii) Mortality assumptions:

At issue	${}_{k\|}q_{42} = 0.02, \quad 0 \le k \le 51$ and ${}_{k\|}q_{42} = 0, \quad k \ge 52$
Revised prospectively at time 10	${}_{k\|}q_{52} = 0.04, \quad 0 \le k \le 24$ and ${}_{k\|}q_{42} = 0, \quad k \ge 25$

(iii) ${}_{10}L$ is the prospective loss random variable at time 10 using the contract premium.

Calculate $E[{}_{10}L|K(42) \geq 10]$ using the revised mortality assumptions.

- a. 595
- b. 663
- c. 735
- d. 603
- e. 591
- Unanswered

The time is 8:55

---

19. A whole life insurance on (10) pays 4000 at the end of year of death. Premiums are paid annually at the beginning of the year up to age 66. The net premium for the first 13 years is $4000P_{13}$ followed by 4000 P for the remaining 43 years. You are given:

(i) $A_{10} = 0.03$
(ii) $A_{23} = 0.06$
(iii) $\ddot{a}_{10} = 15$
(iv) $\ddot{a}_{10:\overline{13}|} = 9$
(v) $\ddot{a}_{10:\overline{56}|} = 13$
(vi) $\ddot{a}_{23:\overline{43}|} = 12.23$

Calculate P

- a. 12.00
- b. 11.89
- c. 11.64
- d. 12.29
- e. 11.72
- Unanswered

The time is 8:55

---

20. For a fully discrete life insurance on (x) with premiums determined by the equivalence principle, you are given:

(i) $i = 0.06$
(ii)

k	$\ddot{a}_{x+k}$	A_{x+k}	P_{x+k}	${}_kV_x$	${}^2A_{x+k}$
0					
5	12.690	0.28172			
10	11.613	0.34265			0.15733
15			0.03947	0.23593	
20	9.107			0.33149	

(iii) ${}_kL$ is the random variable for the prospective loss at time k.

Calculate ${}_{10}V_x$

- a. 0.1475
- b. 0.1738
- c. 0.1334
- d. 0.1656
- e. 0.1294
- Unanswered

The time is 8:55

---

21. You are given:

(i) Lives (17) , (34) and (51) are independent.
(ii) The force of mortality for (17) is $\mu_x^1 = \frac{1}{95-x}$
(iii) The force of mortality for (34) is $\mu_x^2 = \frac{1}{103-x}$
(iv) The force of mortality for (51) is $\mu_x^3 = \frac{1}{110-x}$

Calculate the probability that the three lives survive 12 years.

- a. 0.613
- b. 0.557
- c. 0.479
- d. 0.636

- e. 0.486
- Unanswered

The time is 8:55

---

22. The random variables $T(x)$ and $T(y)$ are independent. You are given the following mortality table:

k	q_{x+k}	q_{y+k}
0	0.07	0.09
1	0.08	0.14
2	0.09	0.19

Calculate $q_{x+k:y+k}$ for $k = 1$

- a. 0.292
- b. 0.176
- c. 0.162
- d. 0.226
- e. 0.209
- Unanswered

The time is 8:55

---

23. For two independent lives (40) and (50), you are given:

(i) ${}_4p_{40} = 0.89$
(ii) ${}_4p_{50} = 0.79$
(iii) $q_{44} = 0.032$
(iv) $q_{54} = 0.052$

Calculate ${}_{4|}q_{\overline{40:50}}$

- a. 0.0089
- b. 0.0160
- c. 0.0149
- d. 0.0141

- e. 0.0117
- Unanswered

The time is 8:55

---

24. For two independent lives (41) and (53), you are given

(i) The mortality of (41) follows a constant mortality rate $\mu_1 = 0.040$
(ii) The mortality of (41) follows the constant mortality law with $\mu_2 = 0.062$

Calculate $\mathring{e}_{\overline{41:53}}$.

- a. 31.61
- b. 31.06
- c. 31.33
- d. 32.37
- e. 29.65
- Unanswered

The time is 8:55

---

25. You are given

(i) $T(x)$ and $T(y)$ are not independent.
(ii) $q_{x+k} = q_{y+k} = 0.05, \quad k = 0, 1, 2, \ldots.$
(iii) ${}_k p_{xy} = 1.01 \;\; {}_k p_x \;\; {}_k p_y, \quad k = 0, 1, 2, \ldots.$

Compute $e_{\overline{xy}}$, the curtate expectation of the life of the survivor status.

- a. 26.63
- b. 27.73
- c. 28.65
- d. 29.58
- e. 26.71
- Unanswered

The time is 8:55

---

26. For two independent lives (60) and (66).
You are given

(i) The survival function of (60) follows De Moivre's law with $\omega = 77$.
(ii) The survival function of (66) follows De Moivre's law with $\omega = 80$.

Calculate the probability that at least one of (60) and (66) will die within *6* years.

- a. 0.370
- b. 0.333
- c. 0.630
- d. 0.667
- e. 0.598
- Unanswered

The time is 8:55

---

27. For a double decrement table, you are given:

(i) $\mu_x^{(1)}(t) = 0.4\mu_x^{(\tau)}(t), \quad t > 0$
(ii) $\mu_x^{(\tau)}(t) = kt^2, \quad t > 0$
(iii) $q'^{(1)}_x(t) = 0.03$

Calculate ${}_2q_x^{(2)}$

- a. 0.27
- b. 0.20
- c. 0.22
- d. 0.19
- e. 0.13
- Unanswered

The time is 8:55

---

28. For a fully discrete *9*-year endowment insurance of 1000 on (x), you are given:

(i) Expenses are paid at the beginning of each year.
(ii) Annual per policy renewal expenses are *6*.
(iii) Percent of premium renewal expenses are 9.4% of the expense-loaded premium.
(iv) $1000P_{x:\overline{9}|} = 76.73$
(v) The expense reserve at the end of year *8* is negative 1.52
(vi) Expense-loaded premiums were calculated using the equivalence principle.

Calculate the expense-loaded premium for this insurance.

- a. 92.99
- b. 89.64
- c. 95.62
- d. 92.40
- e. 95.22
- Unanswered

The time is 8:55

---

29. Your age is 32 and you want to buy a three-year term life policy with a benefit of 2,000 payable at the end of year of death. Suppose that $i = 0.07$ and
$p_{32} = 0.95, \quad p_{33} = 0.93, \quad p_{34} = 0.9, \; p_{35} = 0.87.$
Find the variance of the loss function at issue.

- a. 534,400
- b. 537,300
- c. 549,300
- d. 520,400
- e. 533,200
- Unanswered

The time is 8:55

---

30. For a single premium, continuous whole life insurance issued to (x) with face amount f you are given

1. $\overline{A}_x = 0.18$
2. Percent of premium expenses are *8*% of the expense loaded premium.

3. Per policy expenses are 79 at the beginning of the first year and 26 at the beginning of each subsequent year.
4. Claim expenses are 17 at the moment of death.
5. $i = 0.05$
6. Deaths are uniformly distributed over each year of age.
7. The expense loaded premium is expressed as $gf + h$

Calculate h

- a. 540
- b. 555
- c. 550
- d. 544
- e. 559
- Unanswered

The time is 8:55

Make sure that you answered all the problems before clicking below. Please report any bug to:
saabactuarial at yahoo.com
Copy and paste the problem where you think there is a bug and give reasons to support your claim. This will help us make this site better. Thanks.

Submit Your Work
