1. Suppose that the survival function is given by

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

Compute ${}_{10}p_{49}$

- a. $\frac{14}{17}$
- b. $\frac{40}{51}$
- c. $\frac{43}{51}$
- d. $\frac{13}{17}$
- e. $\frac{41}{51}$
- Unanswered

The time is 9:57

2. The force of mortality at age x is given by

$$\mu(x) = \frac{10}{107 - x}, \quad 0 \le x < 107.$$

Compute $E(T(81)^2]$.

- a. $\frac{337}{33}$
- b. $\frac{113}{11}$
- c. $\frac{338}{33}$
- d. $\frac{112}{11}$
- e. $\frac{340}{33}$
- Unanswered

The time is 9:57

3. Suppose that $\mu = 0.291$ and that the force of interest is $\delta = 0.498$.

For an individual of age (x), compute $(D\,\overline{A})^{1}_{x:\overline{6}|}$.

- a. 1.9125
- b. 1.8821
- c. 1.9036
- d. 1.8983
- e. 1.9086
- Unanswered

The time is 9:57

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4. For a 3-year term insurance on (x), you are given:

(i) Z is the present value random variable for the deaths benefits.
(ii) $q_{x+k} = 0.017(k+1), \quad k = 0,\ 1,\ 2.$
(iii) The following death benefits, payable at the end of the year of death:

k	b_{k+1}
0	400,000
1	450,000
2	500,000

(iv) $i = 0.04$

Calculate $E(Z)$.

- a. 42,471
- b. 42,871
- c. 41,971
- d. 41,471
- e. 41,371
- Unanswered

The time is 9:57

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5. You are given $\mu = 0.022$ and $\delta = 0.05$.
Compute $\overline{a}_{x:\overline{13}|}$.

- a. 7.609
- b. 8.442
- c. 8.855

- d. 9.875
- e. 7.180
- Unanswered

The time is 9:57

6. You are given:

(i) ${}_1E_x = 0.9$
(ii) $A^{\,1}_{x:\overline{1}|} = 0.02$

Calculate v.

- a. 0.88
- b. 0.91
- c. 0.89
- d. 0.90
- e. 0.92
- Unanswered

The time is 9:57

7. In this problem, we use the illustrative life table at 6% . Suppose that death is uniformly distributed over the year of death.
Find the actuarial present value of a whole life insurance that pays 1000 at the end of quarter of death for a person aged 38.
In other words, Calculate $1000A^{(4)}_{38}$.

- a. 146.531
- b. 142.182
- c. 150.736
- d. 160.364
- e. 142.038
- Unanswered

The time is 9:57

8. You are given:

(i) $A_{30} = 0.25$
(ii) $A_{44} = 0.3$
(iii) $A^{\,1}_{30:\overline{14}|} = 0.07$

Calculate ${}_{14}E_{30}$.

- a. 0.61
- b. 0.64
- c. 0.60
- d. 0.57
- e. 0.56
- Unanswered

The time is 9:57

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9. Your company currently offers a whole life annuity product that pays the annuitant 25,000 at the beginning of each year. A member of your product development team suggests enhancing the product by adding a death benefit that will be paid at the end of year of death.
Using a discount rate d of 5%, calculate the death benefit that minimizes the variance of the present value random variable of the new product.

- a. 200,000
- b. 500,000
- c. 400,000
- d. 700,000
- e. 800,000
- Unanswered

The time is 9:57

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10. 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.

Find the continuous annual premium for a whole life policy of a life aged (41) that pays 30,000 at the moment of death.
In other words, compute $30{,}000\overline{P}(\overline{A}_{41})$.

- a. 378
- b. 352
- c. 379
- d. 367
- e. 385
- Unanswered

The time is 9:57

11. Your stated age is 29 and you want to buy a fully discrete three-year term life policy with a benefit of 100,000 payable at the end of year of death. Suppose that $i = 0.047$ and
$p_{29} = 0.94, \quad p_{30} = 0.92, \quad p_{31} = 0.89, \; p_{32} = 0.86.$
The insurance company discovered your age at issue was really 30. Using the equivalence principle, the insurance company adjusted the death benefit to the level benefit it should have been at issue, given the premium charged.
Compute the adjusted death benefit.

- a. 76,104
- b. 76,151
- c. 76,131
- d. 75,965
- e. 75,794
- Unanswered

The time is 9:57

12. On January 1, 2002, Pat age 40 purchases a 5-payment, 10-year term insurance of 200,000. Your are given:

(i) Death Benefits are payable at the moment of death.
(ii) Contract premiums of 8,000 are payable annually at the beginning of each year for 5 years.
(iii) $i = 0.03$.
(iv) L is the loss function at time of issue.

Calculate the value of L if Pat dies on June 30, 2005.

- a. 147,403
- b. 149,714
- c. 147,252
- d. 152,331
- e. 151,909
- Unanswered

The time is 9:57

13. For a special 2-payment whole life insurance on (83).
Your are given:

(i) Premiums of π are paid at the beginning of years 1 and 3.
(ii) The death benefit is paid at the end of the year of death.
(iii)There is a special refund of premium feature:

If (83) dies in either year 1 or year 3, the death benefit is $800 + \frac{\pi}{2}$. Otherwise the death benefit is 800.

(iv) Mortality follows the illustrative life table at 6%.
Click here to see the table in a different window

Calculate π using the equivalence principle.

- a. 356
- b. 344
- c. 341
- d. 353
- e. 350
- Unanswered

The time is 9:57

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14. Use the illustrative life table at 6%.
Click here to see the table in a different window to compute

$$\ddot{a}_{42:\overline{16|}}$$

- a. 10.41
- b. 11.68
- c. 11.62
- d. 9.07
- e. 9.22
- Unanswered

The time is 9:57

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15. You are given:

(i) The net single premium for for a 10,000 whole life insurance policy issued to (49) is 4,000.
(ii) At the end of 9 years, the benefit reserve on 40,000 whole life insurance policy issued to (40) is 7,000.
a(iii) The net single premium for 10,000 whole life insurance issued to (40) is P.

Calculate P.

- a. 2,527

- b. 2,627
- c. 2,957
- d. 2,727
- e. 2,537
- Unanswered

The time is 9:57

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16. 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	0.09	0.11
1	0.10	0.16
2	0.11	0.21

Calculate $p_{x+k:y+k}$ for $k = 2$

- a. 0.606
- b. 0.762
- c. 0.774
- d. 0.703
- e. 0.638
- Unanswered

The time is 9:57

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17. You are pricing a special 3-year life annuity-due on two lives each age x, with independent future lifetimes. The annuity pays 7,000 if both persons are alive and 1,000 if exactely one person is alive.
You are given:

(i) $q_{xx} = 0.04$
(ii) $q_{x+1:x+1} = 0.010$
(iii) $i = 0.04$

Calculate the APV of this annuity.

- a. 19,800
- b. 20,000
- c. 20,100
- d. 19,700
- e. 19,600
- Unanswered

The time is 9:57

18. You are given that (88) and (88) are independent and their mortality follows De Moivre's Law with $\omega = 99$.
Calculate the probability that the last survivor die between ages 94 and 95.

- a. 0.11
- b. 0.07
- c. 0.14
- d. 0.08
- e. 0.10
- Unanswered

The time is 9:57

19. Twins age (x) purchase a fully continuous joint life annuity along with provision for joint life insurance. The future lifetimes are independent and identically distributed. You are given:

(i) $\delta = 0.041$
(ii) $\mu_x(t) = 0.042$ for all x and t
(iii) the special annuity (with insurance provosion) pays:
2000 per year while both are alive,
2000 at the moment of the first death,
1200 per year after the first death until the second death and
720 at the moment of the second death

Calculate the APV of this special annuity (with insurance provision) .

- a. 27,900
- b. 28,100
- c. 26,400
- d. 28,200
- e. 27,300
- Unanswered

The time is 9:57

20. Suppose that people arrive at a nice island at a Poisson rate $\lambda = 10$ per hour. The island is open for arrivals for 12 hours per day. The arriving people are coming from either island A or island B. The likelihood that the arriving person is from island A given that it arrives at time t during the day is as follows:

Time t	P[Person from island A]
$0 \le t < 2$	0.4
$2 \le t < 4$	0.5

$4 \le t < 9$	0.4
$9 \le t \le 12$	0.2

What is expected number of people arriving from island A every day?

- a. 42
- b. 43
- c. 44
- d. 47
- e. 46
- Unanswered

The time is 9:57

21. Let Q be a transition probabilty matrix for a homogeneous Markov chain.

$$Q = \begin{pmatrix} 0.69 & 0.31 \\ 0.26 & 0.74 \end{pmatrix}$$

This matrix describes the probabilites of transition between two States S_0 and S_1 of a certain person. Each period represents a year.
This person, in S_0 now, purchases a 4-year Long-Term care insurance policy. You are given:

1. The person is in S_0 in the second time period.
2. Benefits of 10,000 are paid at the beginning of the year if the person is in S_1.
3. Premiums are will be paid at the beginning of the year if a person is in S_0
4. The interest rate is
   $i = 0.05$ in year one
   $i = 0.06$ in year two
   $i = 0.07$ in year three

Find the benefit reserve in the beginning of the second time period.

- a. 1,897
- b. 2,037
- c. 1,796
- d. 1,774
- e. 1,720
- Unanswered

The time is 9:57

22. In a double-decrement table, you are given the following information:

x	$q_x^{(1)}$	$q_x^{(2)}$	$q'^{(1)}_x$	$q'^{(2)}_x$
43	0.20	0.09	-	y
44	-	-	0.18	$2y$

Assume that each decrement is uniformly distributed over each year of age in the double-decrement table.
If $l_{43}^{(\tau)} = 2{,}700$, Calculate $l_{45}^{(\tau)}$.

- a. 1,230
- b. 1,260
- c. 1,220
- d. 1,270
- e. 1,250
- Unanswered

The time is 9:57

23. A population of 6000 lives age 60 is subject to 3 decrements, death (1), disability (2), and retirement (3). You are given:

(i)

x	$q'^{(1)}_x$	$q'^{(2)}_x$	$q'^{(3)}_x$
60	0.010	0.030	0.090
61	0.013	0.052	0.208

(ii) Decrements are uniformly distributed over each age in its associated single decrement table.

Calculate the expected number of people who will be disable before age 62

- a. 413
- b. 382
- c. 429
- d. 414
- e. 384
- Unanswered

The time is 9:57

24. A population of 4000 lives age 60 is subject to 3 decrements, death (1), disability (2), and

retirement (3). You are given:

(i)

x	$q'^{(1)}_x$	$q'^{(2)}_x$	$q'^{(3)}_x$
60	0.008	0.024	0.072
61	0.009	0.036	0.144

(ii) Decrements are uniformly distributed over each age in its associated single decrement table.

Calculate the expected number of people who will retire before age 62.

- a. 790
- b. 836
- c. 744
- d. 789
- e. 762
- Unanswered

The time is 9:57

25. For a special fully discrete whole life insurance of 1000 on (x), you are given:

(i) $i = 0.08$
(ii) Death is the only decrement.
(iii) The annual contract premium (or gross premium) is 100
(iv) Expenses in year 1, payable at the start of the year, are 30% of contract premiums.
(v) $q_x = 0.05$

Calculate the asset share at the end of the first year.

- a. 27
- b. 22
- c. 23
- d. 33
- e. 24
- Unanswered

The time is 9:57

26. For a population whose mortality follows DeMoivre's law, you are given:

(i) $\mathring{e}_{\overline{44:44}} = 6\mathring{e}_{\overline{66:66}}$
(ii) $\mathring{e}_{\overline{22:22}} = k\mathring{e}_{\overline{66:66}}$

Calculate k.

- a. 11.5
- b. 10.0
- c. 10.5
- d. 11.0
- e. 12.0
- Unanswered

The time is 9:57

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27. For (x), you are given:

(i) K is the curtate future lifetime random variable
(ii)

k	q_{x+k}
0	0.23
1	0.33
2	0.43

Calculate $E\left[(K \wedge 3)^2\right]$

- a. 3.79
- b. 3.88
- c. 3.71
- d. 3.72
- e. 3.67
- Unanswered

The time is 9:57

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28. The expense-loaded premium G for a fully discrete 3-year endowment insurance of 1000 on the life of (x). G is equal to the net level premium + e
You are given:

(i) Expenses are paid at the beginning of the year and are as follows:

Year	% of Premium Expenses	Per Policy expenses
1	12 %	*8*
Renewal	*8* %	*2*

(ii) $G = 342.86$
(iii) The expense reserve two years after issue is -15.95

Calculate $1000P_{x:\overline{3}|}$.

- a. 297.48
- b. 292.32
- c. 306.21
- d. 300.32
- e. 291.11
- Unanswered

The time is 9:57

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29. For a 20-payment whole life insurance with annual premiums, you are given:

(i) Expenses are paid at the beginning of the year and are as follows:

Year	% of Premium Expenses	Per Policy expenses
1	103 %	54
Years 2-10	10 %	19
Years 11 and after	5 %	19

(ii) $\ddot{a}_x = 16.12$

(iii) $\ddot{a}_{x:\overline{10|}} = 7.38$

(iii) $\ddot{a}_{x:\overline{20|}} = 12.15$

Calculate the policy fee to be paid each year

- a. 36.35
- b. 38.12
- c. 33.32
- d. 37.96
- e. 35.43
- Unanswered

The time is 9:57

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30. Your age is 29 and you want to buy a 4-year term life policy with a benefit of 2,000 payable at the end of year of death. Suppose that $i = 0.07$ and
$p_{29} = 0.95, \quad p_{30} = 0.93, \quad p_{31} = 0.9, \; p_{32} = 0.87.$
Find the variance of the loss function at issue.

- a. 728,700
- b. 725,300
- c. 725,100
- d. 726,800

- e. 727,900
- Unanswered

The time is 9:57

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