1. Suppose that the survival function is given by

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

Compute $P[K(36) = 5]$

- a. $\frac{1}{36}$
- b. $\frac{1}{5}$
- c. $\frac{1}{64}$
- d. $\frac{1}{50}$
- e. $\frac{1}{80}$
- Unanswered

The time is 9:12

2. The following mortality table is for United Kindom Males based on data from 2002-2004.
Click here to see the table in a different window
Compute ${}_{74}d_{7}$.

- a. 55846.2
- b. 55829.9
- c. 55864.1
- d. 55828.2
- e. 55828.9
- Unanswered

The time is 9:12

3. Suppose that $s(x) = e^{-\theta x}$ and θ is uniformly distributed over $(1, 13)$. What is the probability of surviving to time 0.4 for an individual selected at random at time $t = 0$.

- a. 0.17
- b. 0.15
- c. 0.14
- d. 0.10
- e. 0.13
- Unanswered

The time is 9:12

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4. The future life of (0) follows a two-parameter Pareto distribution with parameters $\theta = 50$ and $\alpha = 3$.
Calculate $\mathring{e}_{20}$

- a. 33.44
- b. 34.15
- c. 35.29
- d. 35.00
- e. 37.71
- Unanswered

The time is 9:12

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5. Suppose that $\mu_x = \frac{1}{97-x}, \quad 0 \le x \le 97$ and that the force of interest is $\delta = 0.04$.
The insurance policy pays 13 units of benefit at the moment of death. Find the variance of the present value of the benefit for a person aged 56 for an 10-year term life policy.

- a. 21.54
- b. 23.34
- c. 23.12
- d. 23.40
- e. 20.20
- Unanswered

The time is 9:12

---

6. Suppose that $\mu_x = \frac{1}{97-x}, \quad 0 \le x \le 97$ and that the force of interest is $\delta = 0.05$.
The insurance policy pays 12 units of benefit at the moment of death. Find the variance of the present value of the benefit for a person aged 53 for an 8-year pure endowment policy.

- a. 9.625
- b. 10.178
- c. 9.429
- d. 10.599
- e. 10.462
- Unanswered

The time is 9:12

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7. 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 32.

- a. 5.158
- b. 5.030
- c. 5.614
- d. 5.372
- e. 5.639
- Unanswered

The time is 9:12

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8. 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 the year of death.

Find $P(\bar{A}_{61})$.

- a. 0.04658

- b. 0.04668
- c. 0.04655
- d. 0.03615
- e. 0.04689
- Unanswered

The time is 9:12

---

9. A fully discrete 3-year endowment insurance is issued to (x). You are given:

(i) $i = 0.06$
(ii)

y	l_y
x	7000
$x+1$	6300
$x+2$	5670

(iii) $4000 P_{x:\overline{3}|} = 1330.04$

Compute $4000\,{}_1V_{x:\overline{3}|}$

- a. 1122.05
- b. 1094.45
- c. 1092.56
- d. 1101.24
- e. 1143.92
- Unanswered

The time is 9:12

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10. Let ${}_kL$ denote the prospective-loss-at-time- k random variable for a fully discrete whole life insurance of 500 issued to (x).
you are given:

(i) $A_x = 0.124$
(ii) $A_{x+n} = 0.388$

Calculate $500\,E({}_nL)$.

- a. 111
- b. 96
- c. 151
- d. 241
- e. 226
- Unanswered

The time is 9:12

---

11. 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	12.060	0.31733			
10	10.904	0.38279			0.18817
15			0.04717	0.26330	
20	8.299			0.36555	

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

Calculate P_x

- a. 0.01868
- b. 0.02097
- c. 0.01836
- d. 0.02142
- e. 0.01985
- Unanswered

The time is 9:12

---

12. 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	12.060	0.31733			
10	10.904	0.38279			0.18817
15			0.04717	0.26330	
20	8.299			0.36555	

(iv) You might not need all what is given in the table above to do the problem
(iv) ${}_kL$ is the random variable for the prospective loss at time k.

Calculate $\ddot{a}_{x+15}$

- a. 9.509
- b. 9.355
- c. 9.222
- d. 9.636
- e. 9.927
- Unanswered

The time is 9:12

---

13. For a 9-year endowment insurance on (x) you are given:

(i) The death benefits are payable at the moment of death.
(ii) Premiums are paid continuously, are determined using the equivalence principle.
(iii) $\mu_x(t) = 0.045$ for $t > 0$
(iv) $\delta = 0.035$
(v) ${}_tL$ is the prospective loss at time t.
(vi) You may not need all of the above to do the problem.

Calculate ${}^2\bar{A}_{x:\overline{9|}}$

- a. 0.6219768
- b. 0.6212876

- c. 0.6228042
- d. 0.6345412
- e. 0.6075291
- Unanswered

The time is 9:12

---

14. For a portfolio of 1200 insurances, you are given

(i) Each insurance is a fully discrete 5-year term insurance on (50).
(ii) Premiums are determined using the equivalence principle.
(iii) The composition of the portfolio on January 1, 1997 is as follows:

Issue Date	Number	Face Amount
January 1, 1996	300	3000
January 1, 1995	300	1000
January 1, 1994	400	3000
January 1, 1994	200	2000

(iv) ${}_kL$ is the prospective loss random variable for 5-year term insurance of 1000 on (50).
(v)

k	$1000\ {}_kV^{1}_{50:\overline{5}|}$	$\mathrm{Var}[{}_kL \mid K(50) \geq k]$
1	1.04	21,129
2	1.64	17,705
3	1.73	13,038

(vi) The losses are independent.

Using the normal approximation, calculate the amount as of January 1, 1997 which will give the insurer a probability of .99 of meeting the future obligations on this block of business.

- a. 32,357
- b. 29,647
- c. 27,247

- d. 28,317
- e. 26,497
- Unanswered

The time is 9:12

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15. A fully discrete whole life insurance with level annual premium issued to (x).
You are given:

(i) $i = 0.053$.
(ii) $q_{x+h-1} = 0.0039$
(iii) The initial reserve for policy year h is 199
(iv)The net amount at risk for policy year h is 1289
(v) $\ddot{a}_x = 16.4$

Calculate the ${}_hV$, the terminal reserve for year h.

- a. 200.940
- b. 204.690
- c. 200.120
- d. 204.520
- e. 211.090
- Unanswered

The time is 9:12

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16. Two lives (x) and (y) have identical expected mortality.
You are given:

(i) $P_x = P_y = 0.09$
(ii) $P_{\overline{xy}} = 0.054$, where $P_{\overline{xy}}$ is the annual benefit premium for a fully discrete insurance of 1 on $\overline{xy}$.
(iii) $d = 0.06$

Calculate P_{xy}, the annual benefit premium for a fully discrete insurance of 1 on $\overline{xy}$

- a. 0.199

- b. 0.247
- c. 0.191
- d. 0.159
- e. 0.138
- Unanswered

The time is 9:12

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17. Suppose that people arrive at a desert island at a Poisson rate $\lambda = 3$ per day. The arriving people are coming from either island A or island B. They arrive from island A with a probability 0.12. What is the probability that at least 2 persons from island A will arrive during 4 days?

- a. 0.5781
- b. 0.6639
- c. 0.4219
- d. 0.3361
- e. 0.3343
- Unanswered

The time is 9:12

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18. Your local grocery store is open 12-hours a day. Custmors arrive to the store from $t = 0$ (7:00 a.m.) to $t = 12$ (7:00 p.m.) according to a nonhomogeneous Poisson process with intensity function

$$\lambda(t) = t(12 - t)$$

What is the probability that there will be fewer than 3 customers who arrived in the first 30 minutes after 7:00 a.m.?

- a. 0.181
- b. 0.271
- c. 0.729
- d. 0.659
- e. 0.819
- Unanswered

The time is 9:12

19. The number of accidents follows a Poisson process with mean *8* per day.
Each accident generates 1,2 or 3 claimants with probabilites

$$0.45, \quad 0.36, \quad 0.19$$

respectively.
Calculate the expected value of the number of claimants in *3* days.

- a. 46
- b. 40
- c. 39
- d. 38
- e. 42
- Unanswered

The time is 9:12

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

$$Q = \begin{pmatrix} 0.19 & 0.26 & 0.55 \\ 0.05 & 0.17 & 0.78 \\ 0.05 & 0.08 & 0.87 \end{pmatrix}$$

This matrix describes the probabilites of transition between three States S_0, S_1 and S_2.
If a person is in S_2 now, what is the probabiliy that he will be in S_1 two periods from now?

- a. 0.0570
- b. 0.0962
- c. 0.8468
- d. 0.1156
- e. 0.0899
- Unanswered

The time is 9:12

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

$$Q = \begin{pmatrix} 0.68 & 0.32 \\ 0.32 & 0.68 \end{pmatrix}$$

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 purchases a 4-year Long-Term care insurance policy. You are given:

1. The person begins the insurance in S_0
2. Benefits of 10,000 are paid at the beginning of the year if the person is in S_1.
3. Premiums of P 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 P.

- a. 4,290
- b. 4,268
- c. 4,224
- d. 4,260
- e. 4,152
- Unanswered

The time is 9:12

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22. You are given the following information about $q_x^{(j)}$

(i) In a double decrement model:
   (a) $j = 1$ if the cause of death is beri-beri.
   (b) $j = 2$ if the cause of death is other than beri-beri.
(ii) $q_x^{(\tau)} = \frac{x}{100}$
(iii) $q_x^{(1)} = \frac{1}{2} q_x^{(1)}$

Calculate the probability that an individual age 39 will die from Beri-Beri within 3 years.

- a. 0.293
- b. 0.172
- c. 0.198
- d. 0.261
- e. 0.175
- Unanswered

The time is 9:12

---

23. For a double decrement model you are given

(i) $\mu_x^{(1)}(t) = \frac{7}{100-x+t}, \quad t \geq 0$

(ii) $\mu_x^{(2)}(t) = \frac{3}{100-x+t}, \quad t \geq 0$

(iii) T is the time until decrement random variable for (x)

(iv) J is the cause-of-decrement random variable for (x)

Calculate

$$f_J(2), \quad \text{for} \quad (46)$$

- a. 0.090
- b. 0.660
- c. 0.300
- d. 0.010
- e. 0.160
- Unanswered

The time is 9:12

---

24. For a double decrement model you are given the following about a person age (x)

(i) $\mu_x^{(1)}(t) = 0.02, \quad t \geq 0$

(ii) $\mu_x^{(2)}(t) = 0.04 \quad t \geq 0$

Where the index (1) indicates death through accidental causes and the index (2) indicates death through non-accidental causes.

Find the probability that (x) will die within the next 10 years due to non-accidental causes.

- a. 0.301
- b. 0.150
- c. 0.358
- d. 0.204
- e. 0.384
- Unanswered

The time is 9:12

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25. For a triple decrement model you are given the following about a person age (x)

(i) $\mu_x^{(1)}(t) = 0.02, \quad t \geq 0$
(ii) $\mu_x^{(2)}(t) = 0.03 \quad t \geq 0$
(iii) $\mu_x^{(3)}(t) = 0.04 \quad t \geq 0$

Where the index (1) indicates death, the index (2) indicates withdrawal for disability and the index (3) indicates withdrawal for all other causes.
Find the probability that (x) will withdraw for all other causes.

- a. 0.444
- b. 0.333
- c. 0.222
- d. 0.394
- e. 0.390
- Unanswered

The time is 9:12

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26. Harold has been disabled and will begin receiving disabilty payments.
You are given:

(i) $v = 0.93$
(ii)The benefit for accidental death (Cause (1)) is 0 for all years.
(iii) $\mu_{65}^{(1}(t) = .1(6 - t), \quad t \leq 6$

(iv) $\mu_{65}^{(2)}(t) = .1t, \quad t \le 6$
(v) Payments of 30,000 begin today, his 65th birthday.
(vi) On every birthdays up to and including his 71th birthday, he will receive 30,000 as long as he has not recovered or died.

Calculate the APV of Harold's disability payments.

- a. 60,191
- b. 55,977
- c. 56,471
- d. 60,721
- e. 60,900
- Unanswered

The time is 9:12

---

27. For a fully continuous whole life insurance on (x), you are given:

(i) The benefit is 2000 for death by accidental means (decrement 1)
(ii) The benefit is 1000 for death by other means (decrement 2)
(iii) The initial expense at issue is 50
(iv) Settlement expenses or *6*% of the benefit payable at the moment of death.
(v) Maintenance expensese are *2* per year, payable continuously.
(vi) The gross or contract premium is 100 per year, payable continuously.
(vii) $\mu_x^{(1)} = 0.003$
(viii) $\mu_x^{(2)} = 0.030$
(ix) $\delta = 0.05$

Calculate the actuarial present at issue of the insurer's expense augmented loss random variable for this insurance.

- a. 671
- b. -671
- c. 0
- d. 694
- e. -694

◉ Unanswered

The time is 9:12

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28. For a 18-year deferred whole life annuity-due of 1 per year on (39), you are given:

(i) Mortality follows De Moivre's law with $\omega = 103$.
(ii) $i = 0$

Calculate the actuarial present value at issue of the annuity.

- a. 13.97
- b. 19.37
- c. 16.89
- d. 19.54
- e. 14.95
- ◉ Unanswered

The time is 9:12

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29. For a triple-decrement model, you are given the following information about a person age (x)

$q'^{(1)}_x$	$q'^{(2)}_x$	$q'^{(3)}_x$
0.09	0.10	0.11

Causes (1) and (2) are uniformly distributed in the single decrement table. Cause (3) occurs at time $t = 0.2$ of the year. Calculate the probabilty that (x) quits for cause (3) within a year.

- a. 0.132
- b. 0.106
- c. 0.026
- d. 0.117
- e. 0.043
- ◉ Unanswered

The time is 9:12

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

1. $\overline{A}_x = 0.19$
2. Percent of premium expenses are 6% of the expense loaded premium.
3. Per policy expenses are 71 at the beginning of the first year and 21 at the beginning of each subsequent year.
4. Claim expenses are 13 at the moment of death.
5. $i = 0.04$
6. Deaths are uniformly distributed over each year of age.
7. The expense loaded premium is expressed as $\text{gf} + h$

Calculate h

- a. 516
- b. 542
- c. 541
- d. 528
- e. 515
- Unanswered

The time is 9:12

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