1. Suppose that $\mu_x = \frac{1}{104-x}, \quad 0 \le x \le 104$ and that the force of interest is $\delta = 0.04$ for an insurance policy issued to a person aged 45.
The insurance policy pays $b_t = e^{0.04\,t}$ benefit at the moment of death. Find the mean of the present value of the benefit if death occurs within the next 11 years.

- a. 0.173
- b. 0.168
- c. 0.175
- d. 0.200
- e. 0.186
- Unanswered

The time is 9:21

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2. Suppose that $\mu = 0.232$ and that the force of interest is $\delta = 0.336$.
For an individual of age (x), compute $\left(\overline{IA}\right)x$.

- a. 0.2689
- b. 0.7191
- c. 0.6689
- d. 0.9827
- e. 0.7892
- Unanswered

The time is 9:21

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3. Suppose that

$$A^{1}_{x:\overline{26}|} = 0.16, \quad A_{x+26} = 0.2, \text{ and } \quad A_{x:\frac{1}{\overline{26}|}} = 0.6$$

Find A_x.

- a. 0.30

- b. 0.28
- c. 0.19
- d. 0.36
- e. 0.32
- Unanswered

The time is 9:21

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4. Use Illustrative Life Table at 6% to compute $\bar{A}^{1}_{58:\overline{19|}}$ under the (UDD) assumption within a year.
Click here to see the table in a different window

- a. 0.23107
- b. 0.27453
- c. 0.16537
- d. 0.29757
- e. 0.18009
- Unanswered

The time is 9:21

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5. An investment fund is established to provide benefits on 400 independent lives of age *x*.

(i) On January 1, 2001, each life is issued a 11-year deferred whole life insurance of 1500, payable at the moment of death.
(ii) Each life is subject to a constant morality of 0.05.
(iii) The force of interest is 0.04.

Calculate the amount needed on January 1, 2001, so that the probability, as determined by the normal approximation, is 0.95 that the fund will have sufficient fund to provide for these benefits.

Need a Z-table

- a. 134,831
- b. 133,831

- c. 136,831
- d. 135,331
- e. 135,831
- Unanswered

The time is 9:21

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6. You are given:

   (i) $q_x = 0.09$
   (ii) $q_{x+1} = 0.22$
   (iii) $i = 0.09$
   (iv) Deaths are uniformly distributed over each year of a age.

Calculate ${}^2\bar{A}^{1}_{x:\overline{2}|}$.

- a. 0.309
- b. 0.180
- c. 0.161
- d. 0.237
- e. 0.156
- Unanswered

The time is 9:21

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7. Suppose $x = 39$. Suppose that T_x has the following pdf

$$f(t) = \begin{cases} 0.1e^{-0.1t}, & 0 \le t \le 11 \\ \dfrac{e^{-1.1}}{50} & 11 \le t \le 61 \end{cases}$$

Calculate the present value of a whole life annuity issued to (x) if $\delta = 0.06$ and one unit of annuity is paid continuously.

- a. 7.134

- b. 7.671
- c. 8.247
- d. 7.421
- e. 8.391
- Unanswered

The time is 9:21

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8. For a group of individuals all age *x*, you are given:

   (i) 21% are smokers and 79% are non-somokers.
   (ii) The constant force of mortality fo smokers is 0.52.
   (iii) The constant force of mortality fo non-smokers is 0.26.
   (iv) $\delta = 0.05$.

Calculate $\mathrm{Var}\left(\bar{a}_{\overline{T(x)|}}\right)$ for an individual chosen at random from this group.

- a. 6.8
- b. 5.1
- c. 5.0
- d. 5.3
- e. 6.2
- Unanswered

The time is 9:21

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9. Your age is 26 and you want to buy a 4-year term life policy with a benefit of 200,000 payable at the end of year of death. Suppose that $i = 0.04$ and
$p_{26} = 0.95, \quad p_{27} = 0.93, \quad p_{28} = 0.9, \; p_{29} = 0.87.$
Find the equivalence premium of this insurance.

- a. 15,951
- b. 16,204
- c. 16,087
- d. 16,208

- e. 16,222
- Unanswered

The time is 9:21

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10. For a special 3-year deferred life annuity-due on (x), you are given

(i) The first annual payment is 500.
(ii) Subsequent annual payments increase by *5*% per year.
(iii) $i = 0.05$
(iv)

n	e_{x+n}	p_{x+n}
0	30.3	-
1	29.7	-
2	29.4	0.97

Calculate the APV of this annuity at the time of the first payment.

- a. 15,145
- b. 15,135
- c. 15,155
- d. 15,235
- e. 15,085
- Unanswered

The time is 9:21

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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	15.287	0.13470			
10	14.686	0.16869			0.05201
15			0.01506	0.11521	

20	13.080			0.17064	

(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. 14.357
- b. 14.265
- c. 14.386
- d. 13.954
- e. 13.515
- Unanswered

The time is 9:21

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12. For a 10-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) $\mu_x(t) = 0.046$ for $t > 0$
(iv) $\delta = 0.038$
(v) ${}_tL$ is the prospective loss at time t.
(vi) You may not need all of the above to do the problem.

Calculate $E[{}_5L|T(x) > 5]$

- a. 0.47
- b. 0.31
- c. 0.34
- d. 0.32
- e. 0.40
- Unanswered

The time is 9:21

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13. For a fully continuous life 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) $\overline{A}_x = 0.041$ for $t > 0$
(iv) $\delta = 0.06$

Calculate $\overline{P}(\overline{A}_x)$.

- a. 0.0010
- b. 0.0045
- c. 0.0026
- d. 0.0044
- e. 0.0052
- Unanswered

The time is 9:21

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14. You are given three mortality assumptions: You are given:

(i) (ILT) Illustrative Life Table at 6%
Click here to see the table in a different window
(ii) (CF) Constant force model, where $s(x) = e^{-\mu x}$
(iii) (DM) De Moivre's models, where $s(x) = 1 - \frac{x}{\omega}, \quad 0 \le x \le \omega, \quad \omega > 63$

You also know that ${}_2p_{61}$ is the same for all three mortality assumptions.
Rank $e_{61:\overline{2}|}$ for the three models.

- a. ILT < CF < DM
- b. CF < DM < ILT
- c. ILT < DM < CF
- d. DM < CF < ILT
- e. DM < ILT < CF
- Unanswered

The time is 9:21

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15. Mortality rates for two lives (x) and (y) are as follows:

t	q_{x+t}	q_{y+t}
0	0.01	0.019
1	0.019	0.026
2	0.03	0.034

Calculate ${}_{2|}q_{xy}$

- a. 0.0599
- b. 0.0584
- c. 0.0616
- d. 0.0598
- e. 0.0631
- Unanswered

The time is 9:21

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16. In a population, non-smokers have a force of mortality equal to one half that of smokers.
For non-smokers

$$l_x^{ns} = 300(98 - x), \quad 0 \le x \le 98$$

Calculate $\mathring{e}_{19:23}$ for smoker (19) and non-smoker (23)

- a. 20.13
- b. 19.26
- c. 19.40
- d. 20.45
- e. 19.82
- Unanswered

The time is 9:21

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

(i) $P_x = P_y = 0.105$

(ii) $P_{\overline{xy}} = 0.063$, where $P_{\overline{xy}}$ is the annual benefit premium for a fully discrete insurance of 1 on $\overline{xy}$.
(iii) $d = 0.04$

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

- a. 0.205
- b. 0.120
- c. 0.135
- d. 0.113
- e. 0.237
- Unanswered

The time is 9:21

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18. Two independent lives (x) and (y) purchased a continuous annuity of 10,000 per year as long as one of them survives. You are given:

(i) $\delta = 0.039$
(ii) $\mu_x(t) = 0.041$ for all x and t
(iii) $\mu_y(t) = 0.031$ for all y and t

Calculate the APV of this annuity

- a. 176,900
- b. 177,800
- c. 177,900
- d. 177,700
- e. 178,100
- Unanswered

The time is 9:21

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19. For last-survivor whole life insurance of 10000 on (x) and (y), you are given:

(i) The death benefit is payable at the moment of the second death.
(ii) The independent random variables $T^*(x)$, $T^*(y)$, and Z are the componenents of a

common shock model
(iii) $T^*(x)$ has an exponential distribution with force $\mu_x = 0.047$
(iv) $T^*(y)$ has an exponential distribution with force $\mu_y = 0.057$
(iv) Z the common shock random variable, has an exponential distribution with force $\mu_z = 0.027$
(iv) $\delta = 0.057$

Calculate the APV of this life insurance.

- a. 0.393
- b. 0.464
- c. 0.381
- d. 0.411
- e. 0.377
- Unanswered

The time is 9:21

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20. Suppose that people arrive at a desert island at a Poisson rate $\lambda = 4$ per day. The arriving people are coming from either island A or island B. They arrive from island A with a probability 0.13. What is the probability that at least 3 persons from island A will arrive during 4 days?

- a. 0.6550
- b. 0.5804
- c. 0.4196
- d. 0.3335
- e. 0.3450
- Unanswered

The time is 9:21

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

$$Q = \begin{pmatrix} 0.29 & 0.22 & 0.49 \\ 0.17 & 0.06 & 0.77 \\ 0.15 & 0.01 & 0.84 \end{pmatrix}$$

This matrix describes the probabilites of transition between three States S_0, S_1 and S_2. If a person is in S_1 now, what is the probabiliy that he will be in S_1 througout the next 2 periods?

- a. 0.004376
- b. 0.003181
- c. 0.004522
- d. 0.002708
- e. 0.003600
- Unanswered

The time is 9:21

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22. For a triple-decrement model, you are given the following information:

x	$q_x^{(1)}$	$q_x^{(2)}$	$q_x^{(3)}$
37	0.10	0.12	0.02
38	0.05	0.11	0.08
39	0.08	0.06	0.12
40	0.11	0.09	0.06
41	0.14	0.08	0.10
42	0.03	0.09	0.07

If $l_{37}^{(\tau)} = 1000$, compute

$$l_{42}^{(\tau)}$$

- a. 316.29
- b. 760.00
- c. 215.08

- d. 215.13
- e. 215.02
- Unanswered

The time is 9:21

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

(i) $\mu_x^{(1)}(t) = 0.03, \quad t \geq 0$
(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 due to non-accidental causes.

- a. 0.429
- b. 0.571
- c. 0.530
- d. 0.651
- e. 0.519
- Unanswered

The time is 9:21

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

(i) $\mu_x^{(1)}(t) = 0.01, \quad t \geq 0$
(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 in the next 13 years.

- a. 0.242
- b. 0.081

- c. 0.323
- d. 0.259
- e. 0.257
- Unanswered

The time is 9:21

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25. For special whole life insurance, you are given:

(i) Benefits are payable at the the moment of death.
(ii)The benefit for accidental death (Cause (1)) is 80,000 for all years.
(iii) The benefit for non-accidental death (Cause (2)) for the first *3* years is return of the single benefit premium *P* without interest.
(iv) The benefit for non-accidental death after the first *3* years is 40,000
(v) $\mu^{(1}(t) = 0.03, \quad t \geq 0$
(vi) $\mu^{(2)}(t) = 2.02, \quad t \geq 0$
(vii) $\delta = 0.06$

Calculate *P*.

- a. 27,200
- b. 27,000
- c. 27,300
- d. 27,600
- e. 27,400
- Unanswered

The time is 9:21

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

(i) $v = 0.92$
(ii)The benefit for accidental death (Cause (1)) is 0 for all years.
(iii) $\mu_{63}^{(1}(t) = .1(6 - t), \quad t \leq 6$
(iv) $\mu_{63}^{(2)}(t) = .1t, \quad t \leq 6$
(v) Payments of 30,000 begin today, his 63^{th} birthday.
(vi) On every birthdays up to and including his 69^{th} birthday, he will receive 30,000 as long as he has not recovered or died.

Calculate the APV of Harold's disability payments.

- a. 59,591
- b. 54,823
- c. 55,281
- d. 59,953
- e. 60,088
- Unanswered

The time is 9:21

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27. A casino has a game that makes payouts at a Poisson rate of *4* per hour and the payout amounts are 1, 2, 3,... without limit. The probability that any given payout is equal to i is $\frac{1}{2^i}$. Payouts are independent.
Calculate the probability that there are no payouts of 1, 2, or 3 in a given 10 minute period.

- a. 0.62
- b. 0.61
- c. 0.65
- d. 0.47
- e. 0.56
- Unanswered

The time is 9:21

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28. For an insurance on (x) and (y):

(i) Upon the first death, the survivor receives the single benefit premium for a whole life insurance of 20,000 payable at the moment of death of the survivor.
(ii) $\mu_x(t) = \mu_y(t) = 0.06$ while both are alive.
(iii) $\mu_{xy}(t) = 0.11$
(iv) After the first death, $\mu(t) = 0.09$ for the survivor.
(v) $\delta = 0.06$

Calculate the actuarial present value of this insurance on (x) and (y).

- a. 6,000
- b. 7,600
- c. 7,400
- d. 8,100
- e. 7,800
- Unanswered

The time is 9:21

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29. For (x), you are given:

(i) K is the curtate future lifetime random variable

(ii)

k	q_{x+k}
0	0.24
1	0.34
2	0.44

Calculate $E(K \wedge 3)$

- a. 1.79
- b. 1.69
- c. 1.81
- d. 1.54
- e. 1.45
- Unanswered

The time is 9:21

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30. For two independent lives (x) and (y), you are given:

(i) $K_{\overline{xy}}$ is the curtate future lifetime of the last survivor.

(ii)

k	q_{x+k-1}	q_{y+k-1}
1	0.3	0.4
2	0.5	0.6

3	0.6	0.8

Calculate $\mathrm{Var}(K_{\overline{xy}} \wedge 3)$

- a. 0.92
- b. 0.90
- c. 0.91
- d. 0.77
- e. 0.85
- Unanswered

The time is 9:21

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