Assessment Ended

STAT 472 - Homework 19 has ended. Your saved answers were submitted automatically.

Problem 1

A fully discrete whole life on (70) provides a death benefit of 17000. The annual gross premium is determined using the equivalence principle using the following assumptions:

- Mortality follows the Standard Ultimate life Table.
- $i = 0.05$
- Commissions as a percent of premium which are 60% in the first year and 4% in renewal years.
- The issue expense at the start of the first year is 100.
- The annual maintenance is 20 at the start of each year including the first year.

The actual experience in the 6th year is:

- Mortality is 85% of the Standard Life Table
- $i = 0.048$
- The annual maintenance expense is 30.
- Commissions and issue expenses are equal to expected.

Calculate:

a) The annual gross premium

b) The gross premium reserve at the end of 5 years

c) The gross premium reserve at the end of 6 years

d) The total gain in the 6th year

Allocate the gain to mortality, interest rate, and expenses in that order:

e) Mortality

f) Interest rate

g) Expenses

a

> 0

$\LaTeX$ ❓

> ❌ **Incorrect**
>
> **Your Answer:** 0
>
> **Correct Answer:** 694.68
>
> $PVB + PVE = PVP \Longrightarrow P\ddot{a}_{70} = 17000A_{70} + 0.56P + 0.04P\ddot{a}_{70} + 100 + 20\ddot{a}_{70}$
>
> $$P = \frac{17000A_{70} + 100 + 20\ddot{a}_{70}}{(0.96\ddot{a}_{70} - 0.56)} = \frac{17000 \cdot 0.42818 + 100 + 20 \cdot 12.0083}{(0.96 \cdot 12.0083 - 0.56)} = 694.68$$

Show Your Attempts ⌄   **Unlimited attempts**
Submitted Dec 8, 8:38 PM

b

$\LaTeX$ ❓

> ❌ **Incorrect**
>
> **Correct Answer:** 1973.05
>
> $PVB + PVE - PVP = 17000A_{75} + 0.04(694.68)\ddot{a}_{75} + 20\ddot{a}_{75} - (694.68)\ddot{a}_{75}$
>
> $= 17000 \cdot 0.50868 + 0.04 \cdot 694.68 \cdot 10.3178 + 20 \cdot 10.3178 - 694.68 \cdot 10.3178 = 1973.05$

Unlimited attempts

c

$\LaTeX$ ❓

> ❌ **Incorrect**
>
> **Correct Answer:** 2483.36
>
> $$= {}_6V = \frac{({}_5V + P - E)(1.06) - 17000q_{x+5}}{1 - q_{x+5}}$$
>
> $$= \frac{(1973.05 + 0.96 \cdot 694.68 - 20) \cdot 1.05 - 17000 \cdot 0.018433}{1 - 0.018433} = 2483.36$$

Unlimited attempts

d

> ⊗ Incorrect
>
> Correct Answer: 24.42
>
> $G_6^{Total} = (1973.05 + 0.96 \cdot 694.68 - 30)(1.048) - 17000 \cdot 0.85 \cdot 0.018433 - 2483.36 \cdot (1 - 0.85 \cdot 0.018433) = 24.42$

Unlimited attempts

e

> ⊗ Incorrect
>
> Correct Answer: 40.14
>
> $G_6^{Mort} = (40.14 + 0.96 \cdot 694.68 - 20)(1.05) - 17000 \cdot 0.85 \cdot 0.018433 - 2483.36 \cdot (1 - 0.85 \cdot 0.018433) = 40.14$

Unlimited attempts

f

> ⊗ Incorrect
>
> Correct Answer: −5.24
>
> $G_6^{Mort+Int} = ((1973.05 + 0.96 \cdot 694.68 - 20)(1.048) - 17000 \cdot 0.85 \cdot 0.018433 - 2483.36 \cdot (1 - 0.85 \cdot 0.018433)) = 34.90$
>
> $G_6^{Int} = G_6^{Mort+Int} - G_6^{Mort} = 34.90 - 40.14 = -5.24$

Unlimited attempts

g

> ⊗ Incorrect
>
> Correct Answer: −10.48
>
> $= G_6^{Total} - G_6^{Mort+Int} = 24.42 - 34.90 = -10.48$

Unlimited attempts

VARIABLE NAME	VALUE
$5V$	1973.051283594
$6V$	2483.355800495
$A1$	0.42818
$a1$	12.0083
$A2$	0.50868
$a2$	10.3178
age	70
$ageplus5$	75
$Answer A$	694.68
$Answer B$	1973.05
$Answer C$	2483.36
$Answer D$	24.42
$Answer E$	40.14
$Answer F$	−5.24
$Answer G$	−10.48
DB	17000
$IGain$	−5.239887815
$MGain$	40.137795379

RESPONSE	ANSWER	ANSWER RANGE
a.	694.68	[694.58, 694.78]
b.	1973.05	[1972.55, 1973.55]
c.	2483.36	[2482.86, 2483.86]
d.	24.42	[23.92, 24.92]
e.	40.14	[39.64, 40.64]
f.	−5.24	[−5.74, −4.74]
g.	−10.48	[−10.98, −9.98]

$MIGain$	34.90
P	694.679816717
$q2$	0.018433
$TGain$	24.417907564

Problem 2

Your company issues fully discrete (meaning the death benefit is paid at the end of the year of death and premiums are paid at the beginning of the year) whole life policies to a group of lives age 40. For each policy, you are given:

- The death benefit is 50,000.
- Assumed mortality and interest are the Standard Ultimate Life Table at 5%.
- Assumed gross premium is 125% of the net premium.
- Assumed expenses are 5% of gross premium, payable at the beginning of each year, and 300 to process each death claim, payable at the end of the year of death.
- Profits are based on gross premium reserves.

During year 11, actual experience is as follows:

- There are 1000 lives in force at the beginning of the year.
- There is one death.
- Interest earned equals 4%.
- Expenses equal 8% of gross premiums and 133 to process each death claim.

For year 11, the order for calculating gain is mortality, expenses, and then interest.

Calculate the gain due to expenses during year 11.

	$\LaTeX$?

> ❌ **Incorrect**
>
> **Correct Answer:** -12.74
>
> G^M = Gain from Mortality
>
> G^E = Gain from Expenses
>
> $$P = \frac{50000 A_{40}}{\ddot{a}_{40}} = \frac{50000\,(0.12106)}{18.4578} = 327.93724$$
>
> Therefore Gross $= 327.93724\,(1.25) = 409.92$
>
> $$= {}_{10}V = (50000 + 300)A_{50} - (1 - 0.050)(409.92)\ddot{a}_{50}$$
>
> $$= 50300\,(0.18931) - 0.95\,(409.92)(17.0245) = 2892.54$$
>
> $$= {}_{11}V = (50000 + 300)A_{51} - (1 - 0.050)(409.92)\ddot{a}_{51}$$
>
> $$= 50300\,(0.19780) - 0.95\,(409.92)(16.8461) = 3389.06$$
>
> $$G^M = (2892.54 + (409.92)(0.95))(1.05) - 0.001\,(50300) - (1 - 0.001)(3389.06) = 10.09$$
>
> $$G^{M+E} = \left(2892.54 + 409.92 \cdot \left(1 - \frac{8}{100}\right)\right) \cdot 1.05 - 0.001 \cdot (50000 + 133) - (1 - 0.001) \cdot 3389.06 = -2.65$$
>
> $$G^E = G^{M+E} - G^M = -2.65 - 10.09 = -12.74$$

Unlimited attempts

VARIABLE NAME	VALUE		RESPONSE	ANSWER	ANSWER RANGE
$Answer$	-12.74		1.	-12.74	$[-13.24, -12.24]$
$DExp$	133				
Exp	8				
GME	-2.65				
i	4				

Problem 3

Norris Life Insurance Company sells a whole life policy with a benefit of 1 million to (65). The death benefit is payable at the end of the year of death. The policy has level annual premiums. You are given the following assumptions:

- Mortality follows the mortality in the Standard Ultimate Life Table.
- Interest is 5% per annum.
- Expenses at the beginning of each year are as follows:
  - Per policy expense is $245 in the first year and $35 per policy for each year thereafter;
  - Percent of premium expenses are 50% in the first year and 3% thereafter;
  - Per 1000 expense of $1.00 in the first year and $0.10 thereafter; and

- $100 per policy per claim.

a. Calculate the annual net premium.

b. Calculate the annual gross premium using the equivalence principle.

c. Calculate the level annual expense premium.

d. Calculate the net premium reserve at the end of the 10th year.

e. Calculate the expense reserve at the end of the 10th year.

f. Calculate the gross premium reserve at the end of the 10th year.

a

LATEX ?

× Incorrect

Correct Answer: 26182.67

$$P^n = \frac{1000000 A_{65}}{\ddot{a}_{65}} = \frac{1000000 \cdot 0.35477}{13.5498} = 26182.67$$

Unlimited attempts

b

LATEX ?

× Incorrect

Correct Answer: 28228.21

$$PVP = PVB + PVE \implies$$

$$P^g \ddot{a}_{65} = 1000000 A_{65} + (245 - 35) + 35\ddot{a}_{65} + 0.47P^g + 0.03P^g \ddot{a}_{65} + 1000(0.9) + 1000(0.1)\ddot{a}_{65} + 100 A_{65}$$

$$P^g = \frac{(1000000 + 100) \cdot 0.35477 + (245 - 35) + 900 + (100 + 35) \cdot 13.5498}{0.97 \cdot 13.5498 - 0.47} = 28228.21$$

Unlimited attempts

c

LATEX ?

× Incorrect

Correct Answer: 2045.53

$$P^e = P^g - P^n = 28228.21 - 26182.67 = 2045.53$$

Unlimited attempts

d

LATEX ?

× Incorrect

Correct Answer: 238527.51

$$= {}_{10}V^n = 1000000 \left(1 - \frac{\ddot{a}_{75}}{\ddot{a}_{65}}\right) = 1000000 \cdot \left(1 - \frac{10.3178}{13.5498}\right) = 238527.51$$

Unlimited attempts

e

LATEX ?

× Incorrect

Correct Answer: −10924.03

$$= {}_{10}V^e = PVFE - PVFP^e$$

$$= 35\ddot{a}_{75} + (0.03)(28228.21)\ddot{a}_{75} + 1000(0.1)\ddot{a}_{75} + 100 A_{75} - 2045.53\ddot{a}_{75}$$

$$= 100 \cdot 0.50868 + (35 + (0.03 \cdot 28228.21) + 100 - 2045.53) \cdot 10.3178 = -10924.03$$

Unlimited attempts

f

LATEX ?

× Incorrect

$$= {}_tV^g = {}_tV^n + {}_tV^e = 238527.51 - 10924.03 = 227603.48$$

VARIABLE NAME	VALUE		RESPONSE	ANSWER	ANSWER RANGE		PERCENT CORRECT
$Answer\,A$	26182.67		a.	26182.67	$[26182.17, 26183.17]$		-
$Answer\,B$	28228.21		b.	28228.21	$[28227.71, 28228.71]$		-
$Answer\,C$	2045.53		c.	2045.53	$[2045.43, 2045.63]$		-
$Answer\,D$	238527.51		d. Best	238527.51	$[238527.01, 238528.01]$		✔ 100%
$Answer\,E$	-10924.03		d. Alt 1	238532.40	$[238532.30, 238532.50]$		✔ 100%
$Answer\,F$	227603.48		e. Best	-10924.03	$[-10924.53, -10923.53]$		✔ 100%
EP	2045.532311223		e. Alt 1	-10919.14	$[-10919.64, -10918.64]$		✔ 100%
GP	28228.206594238		f. Best	227603.47	$[227602.97, 227603.97]$		✔ 100%
NP	26182.674283015		f. Alt 1	227608.37	$[223056.2026, 232160.5374]$		✔ 100%
$PerClaim$	100						
$PerPolicy1$	245						
$PerPolicy2$	35						
Ve	-10924.032580796						
Vn	238527.505941047						

Problem 4

Norris Life also sells a three year term insurance policy with a death benefit of 7,400 to (x). Annual premiums are payable for three years. Death benefits are assumed to be paid at the end of the year. You are given the following:

- All expenses occur at the beginning of the year.
- Interest is 8%.

Year	Mortality	Per Policy Expense	Percent of Premium Expense
1	0.010	130	20%
2	0.015	30	8%
3	0.020	30	8%

Calculate the gross premium using the equivalence principle.

Complete the following table:

t	${}_tV^n$	${}_tV^e$
0		
1		
2		
3		

a. ${}_0V^n$

b. ${}_0V^e$

c. ${}_1V^n$

d. ${}_1V^e$

e. ${}_2V^n$

f. ${}_2V^e$

g. ${}_3V^n$

h. ${}_3V^e$

a

$\LaTeX$?

Round your answer to 2 decimal places.

✕ Incorrect

Correct Answer: 0.00

We will find the benefit premium and then use the recursive formula to find the net benefit reserves:

$$Net = \frac{7{,}400\left(0.01 \cdot 0.925925926 + 0.99 \cdot 0.015 \cdot 0.925925926^2 + 0.99 \cdot 0.985 \cdot 0.02 \cdot 0.925925926^3\right)}{1 + 0.99 \cdot 0.925925926 + 0.99 \cdot 0.985 \cdot 0.925925926^2} = 100.74$$

$$= {}_0V^n = 0$$

Unlimited attempts

---

b

LATEX ❓

✕ Incorrect

Correct Answer: 0.00

$$Gross = \frac{7{,}400\left(0.01 \cdot 0.925925926 + 0.99 \cdot 0.015 \cdot 0.925925926^2 + 0.99 \cdot 0.985 \cdot 0.02 \cdot 0.925925926^3\right) + 100 + 30\left(1 + 0.9\right.}{0.92 \cdot \left(1 + 0.99 \cdot 0.925925926 + 0.99 \cdot 0.985 \cdot 0.925925926^2\right) - 0.0}$$

$$= {}_0V^g = 0 \text{ Since the premium was determined using the equivalence principle}$$

$$= {}_0V^e = 0$$

Unlimited attempts

---

c

LATEX ❓

✕ Incorrect

Correct Answer: 35.15

$$= {}_1V^n = \frac{(0 + 100.74)1.08 - 7{,}400 \cdot 0.010}{0.99} = 35.15$$

Unlimited attempts

---

d

LATEX ❓

✕ Incorrect

Correct Answer: −88.06

$$= {}_1V^g = \frac{(0 + 187.516007845 \cdot 0.8 - 130)\cdot 1.08 - 7{,}400 \cdot 0.01}{0.99} = -52.92$$

$$= {}_tV^n + {}_tV^e = {}_tV^g$$

$$= {}_1V^e = -52.92 - 35.15 = -88.06$$

Unlimited attempts

---

e

LATEX ❓

✕ Incorrect

Correct Answer: 36.30

$$= {}_2V^n = \frac{(35.15 + 100.74)\cdot 1.08 - 7{,}400 \cdot 0.015}{0.985} = 36.30$$

Unlimited attempts

---

f

LATEX ❓

✕ Incorrect

Correct Answer: −50.75

$$= {}_2V^g = \frac{(-52.915322446 + 187.516007845 \cdot 0.92 - 30)\cdot 1.08 - 7{,}400 \times 0.015}{0.985} = -14.45$$

$$= {}_2V^e = -14.45 - 36.30 = -50.75$$

Unlimited attempts

g

LaTeX ?

Round your answer to 2 decimal places.

> ❌ **Incorrect**
> Correct Answer: 0.00
>
> $= {}_3V^n = 0$ (by definition)

Unlimited attempts

h

LaTeX ?

Round your answer to 2 decimal places.

> ❌ **Incorrect**
> Correct Answer: 0.00
>
> $= {}_3V^e = 0$

Unlimited attempts

VARIABLE NAME	VALUE		RESPONSE	ANSWER	ANSWER RANGE
$0Ve$	0.00		a.	0.00	-
$0Vg$	0.00		b.	0.00	$[-1.00, 1.00]$
$0Vn$	0.00		c.	35.15	$[34.15, 36.15]$
$1G$	-52.92		d.	-88.06	$[-89.06, -87.06]$
$1Ve$	-88.062873652		e.	36.30	$[35.30, 37.30]$
$1Vg$	-52.915322446		f.	-50.75	$[-52.75, -48.75]$
$1Vn$	35.147551206		g.	0.00	-
$2G$	-14.45		h.	0.00	-
$2Ve$	-50.749313547				
$2Vg$	-14.449383601				
$2Vn$	36.299929946				
$3Ve$	0.00				
$3Vg$	0.00				
$3Vn$	0.00				
$AnswerC$	35.15				
$AnswerD$	-88.06				
$AnswerE$	36.30				
$AnswerF$	-50.75				
DB	7,400				
GP	187.516007845				
$Gross$	187.52				
Net	100.74				
NP	100.737107124				
v	0.925925926				

Problem 5

For a fully discrete whole life insurance of 1000 on (80):

- $i = 0.06$
- $\ddot{a}_{80} = 5.89$
- $\ddot{a}_{90} = 3.65$
- $q_{80} = 0.077$

Calculate $_{10}V^{FPT}$, the full preliminary term reserve for this policy at the end of year 10.

$$\boxed{} \quad \text{LaTeX } ?$$

> ✕ **Incorrect**
>
> **Correct Answer:** 350.07
>
> $$PVB - PVP_{x+1}$$
>
> $$P_{81} = \frac{1000A_{81}}{\ddot{a}_{81}} = \frac{1000\,(1 - d\ddot{a}_{81})}{\ddot{a}_{81}}$$
>
> $$\ddot{a}_{81} = \frac{(\ddot{a}_{80} - 1)(1 + i)}{p_{80}}$$
>
> $$= \frac{(5.89 - 1)(1.06)}{(1 - 0.077)} = 5.616$$
>
> $$P_{81} = \frac{1000\left(1 - \left(\frac{.06}{1.06}\right)(5.616)\right)}{5.616} = 121.46$$
>
> $$PVB - PVP_{x+1}$$
>
> $$= 1000A_{90} - 121.46\ddot{a}_{90}$$
>
> $$= 1000\,(1 - d\ddot{a}_{90}) - 121.46\ddot{a}_{90}$$
>
> $$= 1000\left(1 - \left(\frac{.06}{1.06}\right)(3.65)\right) - 121.46\,(3.65)$$
>
> $$= 350.07$$

Unlimited attempts

RESPONSE	ANSWER		ANSWER RANGE
1.	350.07		$[349.97, 350.17]$

Problem 6

You are given that Mortality follows the Standard Ultimate Life Table with $i = 5\%$. Assume that mortality is uniformly distributed between integral ages.

a. Calculate $_{10}V^{FPT}$ (the modified premium reserve using the Full Preliminary Term method) for a whole life policy issued to (60). The death benefit is 75,000 and is payable at the end of the year of death. The insurance has level annual benefit premiums payable for the life of the insured.

b. Calculate $_{10}V^{FPT}$ (the modified premium reserve using the Full Preliminary Term method) for a 20 year term insurance issued to (40). The death benefit is 217,000 and is payable at the end of the year of death. The insurance has level annual benefit premiums payable for 20 years during the life of the insured.

An Endowment to 65 is issued to (35). The death benefit is 15,000 and is payable at the end of the year of death. The insurance has level annual premiums payable for 10 years during the life of the insured. Calculate:

c. $_{5}V^{FPT}$

d. $_{10}V^{FPT}$

> **a**
>
> $$\boxed{} \quad \text{LaTeX } ?$$
>
> > ✕ **Incorrect**
> >
> > **Correct Answer:** 13520.19
> >
> > $$= {}_{10}V^{FPT} = PVB - PVP_{x+1}$$
> >
> > $$= 75{,}000\left(A_{70} - \frac{A_{61}}{\ddot{a}_{61}}\ddot{a}_{70}\right) =$$
> >
> > $$75{,}000\,(0.42818) - \frac{75{,}000\,(0.30243)}{14.6491}\,(12.0083) = 13520.19$$
>
> **Unlimited attempts**

> **b**
>
> $$\boxed{} \quad \text{LaTeX } ?$$
>
> > ✕ **Incorrect**
> >
> > **Correct Answer:** 1111.03
> >
> > $$= {}_{10}V^{FPT} = PVB - PVP_{X+1}$$
> >
> > $$= 217{,}000\left(A_{50:\,\overline{10|}} - {}_{10}E_{50}\right) - 217{,}000\left(\frac{A_{41} - {}_{19}E_{41}\cdot A_{60}}{\ddot{a}_{41} - {}_{19}E_{41}\cdot\ddot{a}_{60}}\right)\left(\ddot{a}_{50:\,\overline{10|}}\right)$$

$$= 217{,}000\,(0.61643 - 0.60182) - 217{,}000\left(\dfrac{0.12665 - 1.05^{-19}\left(\frac{96634.1}{99285.9}\right)\cdot 0.29028}{18.3403 - 1.05^{-19}\cdot\left(\frac{96634.1}{99285.9}\right)\cdot 14.9041}\right)\cdot 8.055$$

$$= 1111.03$$

Unlimited attempts

c

[ ] $\LaTeX$?

> ✕ Incorrect
>
> Correct Answer: 2251.47
>
> $= {}_5V^{FPT} = PVB - PVP_{x+1}$
>
> $$P_{x+1} = 15{,}000\left[\dfrac{A_{36} - {}_{29}E_{36}\cdot A_{65} + {}_{29}E_{36}}{\ddot{a}_{36} - {}_9E_{36}\cdot\ddot{a}_{45}}\right]$$
>
> $$= 15{,}000\cdot\left(\dfrac{0.10101 - 1.05^{-29}\cdot\frac{94579.7}{99517.8}\cdot(0.35477-1)}{18.8788 - 1.05^{-9}\cdot\frac{99033.9}{99517.8}\cdot 17.8162}\right) = 503.32$$
>
> $= {}_5V^{FPT} = 15{,}000\,[A_{40} - {}_{25}E_{40}\,(A_{65}-1)] - 503.32\,(\ddot{a}_{40} - {}_5E_{40}\cdot\ddot{a}_{45})$
>
> $= 15{,}000\,[0.12106 - (0.36663)(0.76687)(0.35477-1)] - 503.32\,[18.4578 - (0.78113)(17.8162)]$
>
> $= 2251.47$

Unlimited attempts

d

[ ] $\LaTeX$?

Round your answer to 2 decimal places.

> ✕ Incorrect
>
> Correct Answer: 5757.75
>
> $= {}_{10}V^{FPT} = PVB$
>
> $= 15{,}000\,A_{45:\,\overline{20|}} = 15{,}000\,(0.38385) = 5757.75$
>
> *Note, only calculate PVB because there are no more premiums

Unlimited attempts

VARIABLE NAME	VALUE		RESPONSE	ANSWER	ANSWER RANGE
aDB	75,000		a.	13520.19	[13519.19, 13521.19]
$Answer\,A$	13520.19		b.	1111.03	[1110.03, 1112.03]
$Answer\,B$	1111.03		c.	2251.47	[2250.47, 2252.47]
$Answer\,C$	2251.47		d.	5757.75	-
$Answer\,D$	5757.75				
bDB	217,000				
$cdDB$	15,000				
cdP	503.320579881				
$cdP2$	503.32				

Problem 7

A whole life policy of 143,000 on (60) has a death benefit payable at the end of the year. The policy has level annual premiums for the life of the insured.

You are given that mortality follows the Standard Ultimate Life Table with interest at 5%.

Calculate:

a. The first year net premium under Full Preliminary Term.

b. The net premium under Full Preliminary Term for renewal years (years 2 and later).

c. Calculate the ${}_{10}V^{FPT}$, the modified net premium reserve at the end of 10 years.

a

[ ] $\LaTeX$?

$$= {}_1P^{FPT} = 143{,}000\,(v)(q_{60}) = 143{,}000\left(\frac{1}{1.05}\right)(0.003398) = 462.78$$

Unlimited attempts

b

LATEX ❓

$$P^{FPT}_{x+1} = \frac{143{,}000 A_{61}}{\ddot{a}_{61}} = \frac{143{,}000\,(0.30243)}{14.6491} = 2952.23$$

Unlimited attempts

c

LATEX ❓

$$= {}_{10}V^{FPT} = PVFB - PVFP^{FPT} = 143{,}000 A_{70} - 2952.23\,\ddot{a}_{70}$$

$$= 143{,}000\,(0.42818) - 2952.23\,(12.0083) = 25778.48$$

OR

$$143{,}000\left(1 - \frac{\ddot{a}_{70}}{\ddot{a}_{61}}\right) = 143{,}000\left(1 - \frac{12.0083}{14.6491}\right) = 25778.68$$

Unlimited attempts

VARIABLE NAME	VALUE	RESPONSE	ANSWER	ANSWER RANGE	PERCENT CORRECT
$Answer\,A$	462.78	a.	462.78	[462.68, 462.88]	-
$Answer\,B$	2952.23	b.	2952.23	[2952.13, 2952.33]	-
$Answer\,C$	25778.68	c. Best	25778.68	[25778.58, 25778.78]	✅ 100%
$Answer\,C2$	25778.48	c. Alt 1	25778.48	[25778.38, 25778.58]	✅ 100%
DB	143,000				

Problem 8

A 20 Year Term policy of 593,000 on (40) has a death benefit payable at the end of the year. The policy has level annual premiums for the life of the insured.

You are given that mortality follows the Standard Ultimate Life Table with interest at 5%.

Calculate:

a. The first year net premium under Full Preliminary Term.

b. The net premium under Full Preliminary Term for renewal years (years 2 and later).

c. Calculate the ${}_{10}V^{FPT}$, the modified net premium reserve at the end of 10 years.

a

LATEX ❓

$$= {}_1P^{FPT} = S\,(v)(q_x) = 593{,}000\left(\frac{1}{1.05}\right)(0.000527) = 297.63$$

Unlimited attempts

b

LATEX ❓

Correct Answer: 698.65

$$P_{x+1}^{FPT} = \frac{593{,}000 A_{41:\,\overline{19|}}^{1}}{\ddot{a}_{41:\,\overline{19|}}} = \frac{593{,}000 \left(0.12665 - v^{19}\left(\frac{l_{60}}{l_{41}}\right)(0.29028)\right)}{18.3403 - v^{19}\left(\frac{l_{60}}{l_{41}}\right)(14.9041)}$$

$$v^{19}\left(\frac{l_{60}}{l_{41}}\right) = 1.05^{-19}\left(\frac{96634.1}{99285.9}\right) = 0.3851644$$

$$P_{x+1}^{FPT} = \frac{8802.774}{12.59977} = 698.65$$

Unlimited attempts

c

$$\boxed{}\quad \text{L\!A\!T\!E\!X ?}$$

✕ Incorrect

Correct Answer: 3036.14

$$= {}_{10}V^{FPT} = PVFB - PVFP^{FPT} = 593{,}000 A_{50:\,\overline{10|}}^{1} - 698.65\ddot{a}_{50:\,\overline{10|}}$$

$$= 593{,}000\,(0.61643 - 0.60182) - 698.65\,(8.0550) = 3036.14$$

Unlimited attempts

VARIABLE NAME	VALUE		RESPONSE	ANSWER	ANSWER RANGE
$Answer\,A$	297.63		a.	297.63	[297.13, 298.13]
$Answer\,B$	698.65		b.	698.65	[698.15, 699.15]
$Answer\,C$	3036.14		c.	3036.14	[3035.64, 3036.64]
DB	593,000				
Den	12.59977				
Num	8802.774				
P	698.645566789				

Problem 9

A 20 Year Endowment policy of 8,000 on (65) has a death benefit payable at the end of the year. The policy has level annual premiums for the life of the insured.

You are given that mortality follows the Standard Ultimate Life Table with interest at 5%.

Calculate:

a. The first year net premium under Full Preliminary Term.

b. The net premium under Full Preliminary Term for renewal years (years 2 and later).

c. Calculate the ${}_{10}V^{FPT}$, the modified net premium reserve at the end of 10 years.

a

$$\boxed{}\quad \text{L\!A\!T\!E\!X ?}$$

✕ Incorrect

Correct Answer: 45.07

$$= {}_{1}P^{FPT} = S(v)(q_x) = 8{,}000\,(1.05)^{-1}\,(0.005915) = 45.07$$

Unlimited attempts

b

$$\boxed{}\quad \text{L\!A\!T\!E\!X ?}$$

✕ Incorrect

Correct Answer: 314.42

$$P_{x+1}^{FPT} = \frac{8{,}000 A_{66:\,\overline{19|}}}{\ddot{a}_{66:\,\overline{19|}}} = \frac{8{,}000\left(A_{66} - v^{19}\left(\frac{l_{85}}{l_{66}}\right)A_{85} + v^{19}\left(\frac{l_{85}}{l_{66}}\right)\right)}{\ddot{a}_{66} - v^{19}\left(\frac{l_{85}}{l_{66}}\right)\ddot{a}_{85}}$$

$$v^{19}\left(\frac{l_{85}}{l_{66}}\right) = (1.05)^{-19}\left(\frac{61184.9}{94020.3}\right) = 0.25752888$$

$$P^{FPT}_{x+1} = \frac{8{,}000\,(0.36878 - 0.2575288\,(0.67622 - 1))}{13.2557 - 0.2575288\,(6.7993)} = 314.42$$

Unlimited attempts

c

LATEX ?

❌ **Incorrect**

Correct Answer: 2909.71

$$= {}_{10}V^{FPT} = PVFB - PVFP^{FPT} = 8{,}000 A_{75:\,\overline{10}|} - 314.42\ddot{a}_{75:\,\overline{10}|}$$

$$= 8{,}000\,(0.65142) - 314.42\,(7.3203) = 2909.71$$

Unlimited attempts

VARIABLE NAME	VALUE		RESPONSE	ANSWER	ANSWER RANGE
$Answer\,A$	45.07		a.	45.07	[44.97, 45.17]
$Answer\,B$	314.42		b.	314.42	[314.32, 314.52]
$Answer\,C$	2909.71		c.	2909.71	[2909.61, 2909.81]
DB	8,000				
P	314.419904400				