Student Name:_____

Purdue ID:_____

STAT 472 – Spring 2025
Quiz 3

MTHW 304 12:55 – 1:15 PM
Tuesday, February 18th, 2025

INSTRUCTIONS

- Do not open this quiz until you are told to do so.
- There are 20 points possible on this quiz.
- You have 20 minutes to complete this quiz.
- Be sure you have filled in your name and Purdue ID in the slots at the top of the page.
- Show all work to maximize partial credit.
- Be sure all cell phones are silenced and put away out of view. This policy applies to smart watches as well.
- Headphones are not permitted unless prior approval was granted by your instructor.
- Formula sheets are not permitted.
- You are only permitted to use calculator(s) from the following list:
    - BA II Plus
    - BA II Plus Professional
    - BA-35
    - TI–30Xa or TI–30XA (same model just different casing)
    - TI-30X II (IIS solar or IIB battery)
    - TI-30XS MultiView (or XB battery)
- When time expires, put your pencil down and close your exam. Failure to do so will result in automatic disqualification from obtaining University-Earned Credit.

PURDUE HONORS PLEDGE

"As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

STUDENT AGREEMENT

By signing below,

- I agree with the Purdue Honors Pledge stated above.
- I will not give or receive any assistance on this exam, and I will report any infractions of the honors pledge.
- I acknowledge that I only used calculator(s) from the above list.
- I am claiming all work in this exam as my own.

X_____

1. (5 points) You are given the following incomplete mortality table.

(x)	l_x	d_x	q_x	p_x
97	--	--	--	0.44
98	--	--	0.20	--
99	--	100	1.00	--

You are also given:

i. $l_{92} = 1000$ and $l_{95} = 800$

ii. Assume constant force of mortality between integral ages.

Calculate ${}_{3|2.6}q_{92}$.

Solution:

$${}_{3|2.6}q_{92} = \frac{l_{95} - l_{97.6}}{l_{92}}$$

$$= \frac{800 - l_{97.6}}{1000}$$

$$= \boxed{0.62640061}$$

$l_{99} = 100$

$l_{98}(1-0.20) = l_{99}$ (100 ↓)

$\therefore l_{98} = 125$ (125 ↙)

$l_{97}(0.44) = l_{98}$

$l_{97} = 284.0\overline{9}$

CFM

$l_{97.6} = (l_{97})^{0.4} (l_{98})^{0.6}$

$= 173.5939164$

Points	
2	Correct setup for ${}_{3|2.6}q_{92}$
3	Correct setup for $l_{97.6}$ • 1 point for geometric interpolation for CFM • 1 point for l_{98} • 1 point for l_{97} *note that if both l bounds are incorrect, if method for flowing from one to the next is correct give 1 point out of the 2

2. (5 points) You are given that the mortality for all Purdue students follow the Standard Ultimate Life Table. There are 15,000 students who are age 20 at Purdue University.

   Let L_{15} be the random variable representing the number who will still be alive at age 35.

   Calculate the $Var(L_{15})$.

   Solution:

$$_{15}p_{20} = \frac{l_{35}}{l_{20}} = \frac{99,556.70}{100,000} = 0.995567$$

$$Var[L_{15}] = 15,000(_{15}p_{20})(_{15}q_{20}) = 15,000(0.995567)(1-0.995567) = 66.20022767$$

Points	
2	Correct setup for $_{15}p_{20}$
2	Correct setup for variance (recognize binomial)

3. For a 2-year select and ultimate table, you are given:

   i. $q_{96} = 0.350,\ q_{97} = 0.475,\ q_{98} = 0.675$

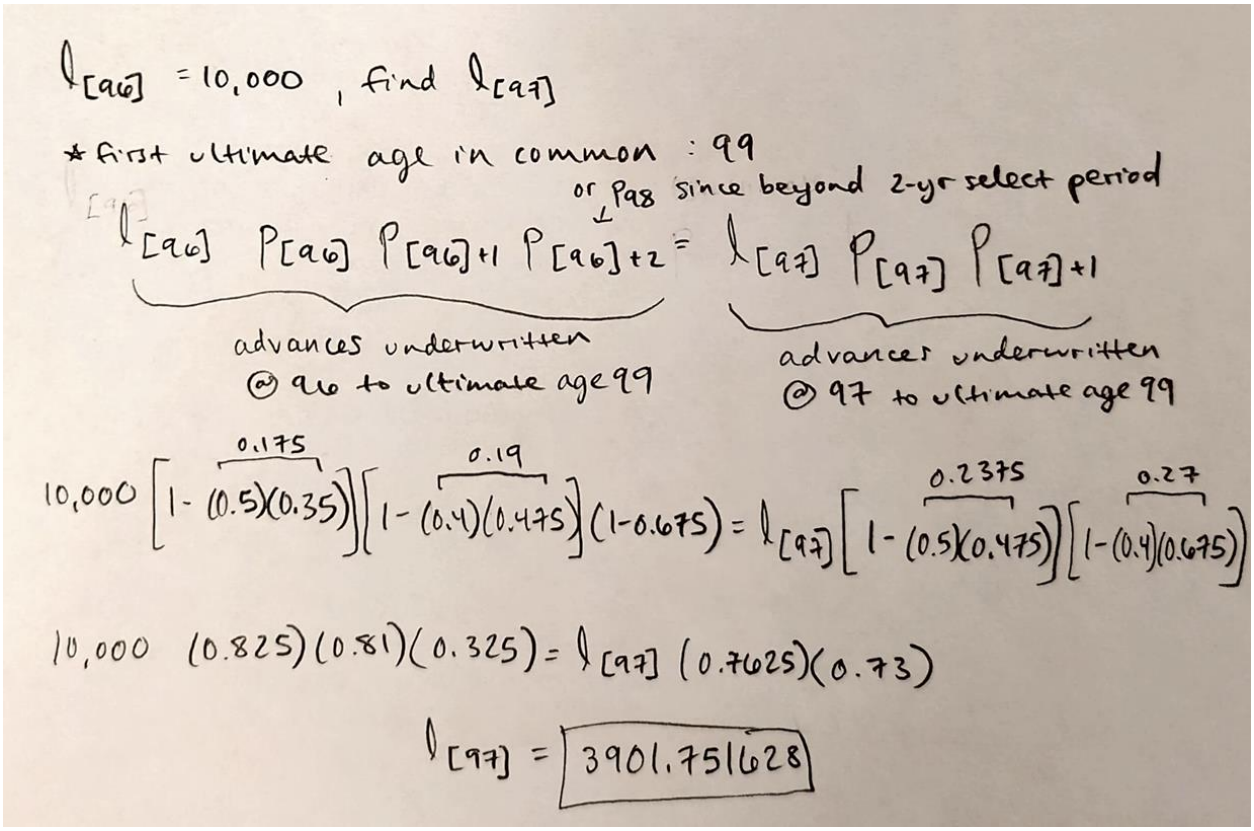
   ii. $q_{[x]} = 0.5q_x$ for all x.

   iii. $q_{[x]+1} = 0.4q_{x+1}$ for all x.

   iv. $l_{[96]} = 10000$

   a. (6 points) Find $l_{[97]}$.

Solution:



Points	
3	Correct determination of corresponding $p_{[x]}$ and $p_{[x]+1}$ values
3	Correct equation of value containing $l_{[96]}$ and $l_{[97]}$

(Continued from Prior Page)

3. *[Problem Restated] For a 2-year select and ultimate table, you are given:*

   i. $q_{96} = 0.350,\ q_{97} = 0.475,\ q_{98} = 0.675$

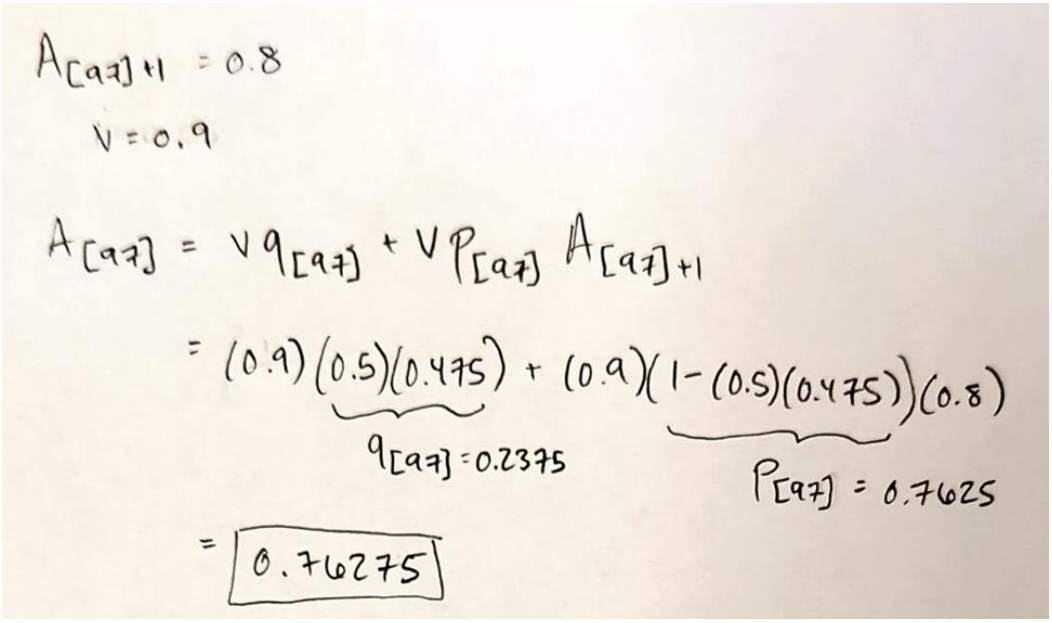
   ii. $q_{[x]} = 0.5q_x$ *for all* x.

   iii. $q_{[x]+1} = 0.4q_{x+1}$ *for all* x .

   iv. $l_{[96]} = 10000$

b. (4 points) Given $A_{[97]+1} = 0.80$ and $v = 0.90$, calculate $A_{[97]}$.

Solution:



Points	
1	Correct setup for $p_{[x]}$
3	Correct setup for recursive formula • 1 point for proper use of v terms • 1 point for correct placement of p and q • 1 point for treatment of A's