L-TAM Module 1 Section 9 Exercises

1. Given a double decrement table with $q_x^{(1)} = .04$ and $p_x^{(\tau)} = .94$, determine $q_x^{(2)}$.

2. For a double decrement table, given $p_x'^{(1)} = 0.95$ and $q_x'^{(2)} = 0.1$, determine $q_x^{(\tau)}$.

3. For a double decrement table, given $p_x'^{(1)} = 0.9$, $q_x^{(1)} = 0.09$, and $p_x^{(\tau)} = 0.72$, determine

   (a) $q_x^{(2)}$
   (b) $q_x'^{(2)}$

4. You are given the double decrement table:

x	$l_x^{(\tau)}$	$q_x^{(1)}$	$q_x^{(2)}$	$q_x'^{(1)}$	$q_x'^{(2)}$
30	1000	0.09			0.20
31	712		0.20	0.15	0.20
32		0.15		0.16	
33	305.0208				

   Determine

   (a) ${}_2q_{31}^{(2)}$
   (b) ${}_{1|2}q_{30}^{(1)}$

5. For a triple decrement table, given $\mu_x^{(1)}(t) = .1$, $\mu_x^{(2)}(t) = .2$, and $\mu_x^{(3)}(t) = .3$. determine

   (a) ${}_5q_x^{(\tau)}$
   (b) ${}_{5|10}q_x^{(2)}$

6. For a triple decrement table, given $\mu_x^{(1)}(t) = .01$, $\mu_x^{(2)}(t) = .02$, and $\mu_x^{(3)}(t) = .03$. determine

   (a) ${}_{10}q_x^{(\tau)}$
   (b) ${}_{10}q_x^{(2)}$
   (c) ${}_{10|10}q_x^{(\tau)}$
   (d) ${}_{10|10}q_x^{(1)}$
   (e) the expected time until departure, $\overset{o}{e}_x^{(\tau)}$

7. For a double decrement table given: $\mu_x^{(1)}(t) = .01 + .01t,\ \mu_x^{(2)}(t) = .02 + .02t,$ and $\mu_x^{(3)}(t) = .03 + .03t,$ determine

(a) ${}_5q_x^{(\tau)}$
(b) ${}_5q_x^{(3)}$
(c) the conditional probability that departure was by decrement 2, given that departure occurred at age x+5
(d) the conditional probability that departure was by decrement 1, given that departure occurred before age x+5

8. You are given the double decrement table:

x	$l_x^{(\tau)}$	$d_x^{(1)}$	$d_x^{(2)}$
50		75	
51	900		
52			25
53			

You are also given:

(i) $q_{50}^{(\tau)} = .1$
(ii) ${}_2p_{50}^{(\tau)} = .825$
(iii) there are twice as many departures from decrement 1 at age 51 as there are from decrement 2 at age 51
(iv) ${}_{2|}q_{50}^{(1)} = .025$

Determine

(a) $q_{50}^{(2)}$
(b) ${}_2q_{51}^{(\tau)}$
(c) ${}_{1|}q_{51}^{(1)}$
(d) ${}_{1|2}q_{50}^{(2)}$

9. Given $l_x^{(\tau)} = 1000$ and a triple decrement table with $\mu_x^{(j)} = 0.1 + 0.2(j-1)$ for j = 1, 2, and 3, determine the expected number of departures between ages x and x+1 by decrement 2.

10. Given a double decrement model with $\mu_x^{(1)} = 0.02$ and $\mu_x^{(2)} = 0.03$, determine

(a) ${}_2p_x^{(\tau)}$
(b) ${}_2q_x^{(1)}$
(c) ${}_2q_x^{(2)}$
(d) ${}_2q_x^{\prime(1)}$
(e) ${}_2q_x^{\prime(2)}$

11. Given a double decrement table where decrement 1 is DML(80) in the associated single decrement table and decrement 2 has $\mu_x^{(2)} = 0.1$, determine

(a) ${}_{10}q_{50}^{(1)}$
(b) $\mu_{50}^{(\tau)}(10)$

12. Given a double decrement table where decrement 1 is DML(100) in the associated single decrement table and decrement 2 has $\mu_x^{(2)} = 0.05$, determine

(a) ${}_{10}q_{30}^{(1)}$
(b) ${}_{10}q_{30}^{(2)}$

13. Given a double decrement model with $p_x^{\prime(1)} = 0.9$ and $p_x^{\prime(2)} = 0.8$, determine $q_x^{(1)}$ and $q_x^{(2)}$ using

(a) MUDD
(b) SUDD

14. Given a double decrement model with $q_x^{(1)} = 0.1$ and $q_x^{(2)} = 0.2$, determine $q_x^{\prime(1)}$ and $q_x^{\prime(2)}$ using

(a) MUDD
(b) SUDD

15. For a double decrement table where each decrement is UDD in the double decrement table, given $q_x^{\prime(1)} = 0.1$ and $q_x^{\prime(2)} = 0.2$, determine

(a) ${}_{0.3}q_x^{(2)}$
(b) ${}_{0.5|0.3}q_x^{(2)}$
(c) ${}_{0.3}q_{x+0.5}^{(2)}$

16. Given a double decrement model with $p_{40}^{\prime(1)} = p_{41}^{\prime(1)} = 0.9$ and $p_{40}^{\prime(2)} = p_{41}^{\prime(2)} = 0.8$, determine ${}_{1.5}q_{40}^{(1)}$ using the SUDD assumption.

17. Given a double decrement table where decrement 1 is BOY and decrement 2 is UDD in the associated single decrement table, and given $q_x^{(1)} = 0.1$ and $q_x^{(2)} = 0.2$, determine

    (a) $q_x^{\prime(1)}$
    (b) $q_x^{\prime(2)}$

18. For a triple decrement table where decrement 1 and decrement 2 are each UDD in their associated single decrement tables, and decrement 3 is EOY, given $q_x^{\prime(j)} = 0.2j$ for j = 1, 2, and 3, determine

    (a) $q_x^{(1)}$
    (b) $q_x^{(2)}$
    (c) $q_x^{(3)}$

19. For a double decrement table where decrement 1 is MOY and decrement 2 is UDD in the associated single decrement table, given $q_x^{\prime(1)} = 0.1$ and $q_x^{\prime(2)} = 0.3$ determine

    (a) $q_x^{(1)}$
    (b) $q_x^{(2)}$

20. For a double decrement table where decrement 1 is SUDD and 25% of decrement 2 occurs at time 0.3 with the rest occurring at time 0.7, given $q_x^{\prime(1)} = 0.2$ and $q_x^{\prime(2)} = 0.4$ determine

    (a) $q_x^{(1)}$
    (b) $q_x^{(2)}$