

MLC Module 1 Section 1 Exercises

1. Given ${}_{20}q_{50} = .75$, determine ${}_{20}p_{50}$
2. Given $p_{30} = .95$, determine q_{30}
3. Given ${}_{10}p_{20} = .9$ and ${}_{20}p_{30} = .6$, determine ${}_{30}p_{20}$
4. Given ${}_{20}p_{40} = .7$ and ${}_5p_{40} = .9$, determine ${}_{15}p_{45}$
5. Given ${}_{35}p_{35} = .32$ and ${}_{20}p_{50} = .4$, determine ${}_{15}q_{35}$
6. Given ${}_{30}p_{20} = \frac{5}{8}$, ${}_{10}p_{60} = \frac{3}{4}$, ${}_{10}q_{20} = \frac{1}{8}$, and ${}_{20}q_{50} = \frac{2}{5}$ determine ${}_{30}q_{30}$
7. Given $p_x = e^{-\mu}$, $p_{x+1} = e^{-3\mu}$, and ${}_2p_x = .1$, determine μ
8. Given ${}_t p_0 = 1 - (.01t)^2$, $0 \leq t \leq 100$, determine
 - (a) ${}_{20}p_{30}$ (Hint: Use factorization and the values of ${}_{30}p_0$ and ${}_{50}p_0$)
 - (b) ${}_t p_{30}$ (Your answer will be an expression involving t .)

9. Given

x	q_x
30	0.1
31	0.2
32	0.3
33	0.4
34	0.5
35	0.6
36	0.7
37	0.8

determine

- (a) ${}_2q_{30}$
 - (b) ${}_2q_{34}$
 - (c) ${}_3q_{30}$
 - (d) ${}_3q_{34}$
10. Given ${}_{20}p_{40} = .63$ and ${}_{15}p_{45} = .7$, determine ${}_{5|15}q_{40}$
 11. Given ${}_{10|20}q_{30} = .2$ and ${}_{10}q_{30} = .15$, determine ${}_{30}p_{30}$

12. Given ${}_{30|20}q_{40} = .19$ and ${}_{30}p_{40} = .2$, determine ${}_{20}q_{70}$

13. Given ${}_k|q_x = .01(k + 1)$ for $k = 0, 1, 2, \dots, 9$, determine ${}_{10}p_x$

14. Given $\int_0^{30} f_{40}(t)dt = 1/2$ and $\int_{10}^{\infty} f_{40}(t)dt = 5/6$, determine ${}_{10|20}q_{40}$

15. Given ${}_{15|20}q_{25} = .18$ and ${}_{15}q_{25} = .1$, determine $\int_{20}^{\infty} f_{40}(t)dt$

16. Given ${}_k|q_{40} = \frac{1}{50}$ for $k = 0, 1, 2, \dots, 49$, determine

(a) $E[\text{Min}(K_{40}, 2)]$

(b) $\text{Var}[\text{Min}(K_{40}, 2)]$

17. Given $q_{x+k} = .1(k + 1)$ for $k = 0, 1, 2, \dots, 9$, determine

(a) q_x

(b) ${}_1|q_x$

(c) ${}_2|q_x$

(d) ${}_3p_x$

18. Using mortality in the previous problems, determine $\text{Var}(\text{Min}(K_x, 3))$

19. Given

K_{90}	Pr
0	.2
1	.3
2	.5

determine

(a) e_{90}

(b) $\text{Var}(K_{90})$

20. Given ${}_k|q_{20} = \frac{1}{80}$ for $k = 0, 1, 2, \dots, 79$, determine e_{20}

21. Given ${}_t p_x = (.91)^t$, determine e_{20}

22. Given ${}_t p_x = e^{-.05t}$, determine $\overset{\circ}{e}_x$

23. Given ${}_t q_{20} = \frac{t}{80}$, $0 \leq t \leq 80$, determine $\overset{\circ}{e}_{20}$

24. Given $e_{50} = 25$ and $p_{50} = .98$, determine e_{51}

25. Given $e_{61} = 10$ and $p_{60} = .95$, determine e_{60}
26. Given $e_{30} = 34.5$, $p_{30} = \frac{69}{70}$, and $p_{31} = \frac{68}{69}$, determine e_{32}
27. Given $e_x = 4.5$, $e_{x+2} = 3.5$, and $p_{x+1} = \frac{8}{9}$, determine p_x
28. Create a 3-year recursion formula for e_x .