# Solutions to Chapter 9 SULT Problems

1. $A_{\overline{34:44}\setminus\overline{6}|} = A_{34:44} - {}_6E_{34:44} \cdot A_{40:50} = 0.16327 - 0.74033 \cdot 0.21163 = \boxed{0.00659}$, where
   ${}_6E_{34:44} = {}_6p_{34:44} \cdot v^6 = 0.99211 \cdot 0.74622 = 0.74033$, where
   ${}_6p_{34:44} = \dfrac{\ell_{40}}{\ell_{34}} \cdot \dfrac{\ell_{50}}{\ell_{44}} = \dfrac{99338.3}{99593.8} \cdot \dfrac{98576.4}{99104.3} = 0.99211$

2. ${}_{35}q_{\overline{44:37}} = {}_{35}q_{44} \cdot {}_{35}q_{37} = 0.21368 \cdot 0.10449 = \boxed{0.02233}$

3. ${}_{28}p_{\overline{33:56}} = {}_{28}p_{33} + {}_{28}p_{56} - {}_{28}p_{33:56} = 0.96664 + 0.66058 - 0.63854 = \boxed{0.98868}$, where
   ${}_{28}p_{33:56} = \dfrac{\ell_{61}}{\ell_{33}} \cdot \dfrac{\ell_{84}}{\ell_{56}} = \dfrac{96305.8}{99629.3} \cdot \dfrac{64506.5}{97651.2} = 0.63854$

4. ${}_{12}q_{\overline{47:51}} = {}_{12}q_{47} \cdot {}_{12}q_{51} = 0.01967 \cdot 0.02969 = \boxed{0.00058}$

5. $\ddot{a}_{63|73} = \ddot{a}_{73} - \ddot{a}_{63:73} = 11.0081 - 10.1925 = \boxed{0.8156}$

6. $\ddot{a}_{67:67:\overline{20}|} = \ddot{a}_{67:67:\overline{10}|} + {}_{10}E_{67:67} \cdot \ddot{a}_{77:77:\overline{10}|} = 7.4704 + 0.47211 \cdot 6.351 = \boxed{10.46877}$, where
   ${}_{10}E_{67:67} = {}_{10}p_{67:67} \cdot v^{10} = 0.76902 \cdot 0.61391 = 0.47211$, where
   ${}_{10}p_{67:67} = \dfrac{\ell_{77}}{\ell_{67}} \cdot \dfrac{\ell_{77}}{\ell_{67}} = \dfrac{81904.3}{93398.1} \cdot \dfrac{81904.3}{93398.1} = 0.76902$

7. ${}_{11}p_{\overline{45:65}} = {}_{11}p_{45} + {}_{11}p_{65} - {}_{11}p_{45:65} = 0.98604 + 0.88426 - 0.87192 = \boxed{0.99838}$, where
   ${}_{11}p_{45:65} = \dfrac{\ell_{56}}{\ell_{45}} \cdot \dfrac{\ell_{76}}{\ell_{65}} = \dfrac{97651.2}{99033.9} \cdot \dfrac{83632.9}{94579.7} = 0.87192$

8. $\ddot{a}_{35:45:\overline{20}|} = \ddot{a}_{35:45:\overline{10}|} + {}_{10}E_{35:45} \cdot \ddot{a}_{45:55:\overline{10}|} = 8.06 + 0.60336 \cdot 7.987 = \boxed{12.87904}$, where
   ${}_{10}E_{35:45} = {}_{10}p_{35:45} \cdot v^{10} = 0.98282 \cdot 0.61391 = 0.60336$, where
   ${}_{10}p_{35:45} = \dfrac{\ell_{45}}{\ell_{35}} \cdot \dfrac{\ell_{55}}{\ell_{45}} = \dfrac{99033.9}{99556.7} \cdot \dfrac{97846.2}{99033.9} = 0.98282$

9. $\ddot{a}_{68|68} = \ddot{a}_{68} - \ddot{a}_{68:68} = 12.6456 - 10.6722 = \boxed{1.9734}$

10. ${}_{20}q_{\overline{54:49}} = {}_{20}q_{54} \cdot {}_{20}q_{49} = 0.11625 \cdot 0.06838 = \boxed{0.00795}$

11. $\ddot{a}_{31|41} = \ddot{a}_{41} - \ddot{a}_{31:41} = 18.3403 - 17.9924 = \boxed{0.3479}$

12. $\ddot{a}_{45:45:\overline{20}|} = \ddot{a}_{45:45:\overline{10}|} + {}_{10}E_{45:45} \cdot \ddot{a}_{55:55:\overline{10}|} = 8.0426 + 0.59927 \cdot 7.9321 = \boxed{12.79607}$, where
   ${}_{10}E_{45:45} = {}_{10}p_{45:45} \cdot v^{10} = 0.97616 \cdot 0.61391 = 0.59927$, where
   ${}_{10}p_{45:45} = \dfrac{\ell_{55}}{\ell_{45}} \cdot \dfrac{\ell_{55}}{\ell_{45}} = \dfrac{97846.2}{99033.9} \cdot \dfrac{97846.2}{99033.9} = 0.97616$

13. $A_{\overline{48:58}\setminus\overline{7}|} = A_{48:58} - {}_7E_{48:58} \cdot A_{55:65} = 0.2957 - 0.685 \cdot 0.38891 = \boxed{0.0293}$, where
   ${}_7E_{48:58} = {}_7p_{48:58} \cdot v^7 = 0.96386 \cdot 0.71068 = 0.685$, where

$${}_7p_{48:58} = \frac{\ell_{55}}{\ell_{48}} \cdot \frac{\ell_{65}}{\ell_{58}} = \frac{97846.2}{98783.9} \cdot \frac{94579.7}{97195.6} = 0.96386$$

14. ${}_8p_{\overline{59:47}} = {}_8p_{59} + {}_8p_{47} - {}_8p_{59:47} = 0.96357 + 0.9896 - 0.95355 = \boxed{0.99962}$, where
${}_8p_{59:47} = \frac{\ell_{67}}{\ell_{59}} \cdot \frac{\ell_{55}}{\ell_{47}} = \frac{93398.1}{96929.6} \cdot \frac{97846.2}{98874.5} = 0.95355$

15. $A_{\overline{\frac{1}{63:73}:\overline{6}|}} = A_{63:73} - {}_6E_{63:73} \cdot A_{69:79} = 0.51464 - 0.63653 \cdot 0.61559 = \boxed{0.1228}$, where
${}_6E_{63:73} = {}_6p_{63:73} \cdot v^6 = 0.853 \cdot 0.74622 = 0.63653$, where
${}_6p_{63:73} = \frac{\ell_{69}}{\ell_{63}} \cdot \frac{\ell_{79}}{\ell_{73}} = \frac{91936.9}{95534.4} \cdot \frac{77927.4}{87916.8} = 0.853$