1) From #1/Section 2: $A_{35} = .12875$

$$\Rightarrow \ddot{a}_{35} = \frac{1 - A_{35}}{d} = \frac{1 - .12875}{(.06/1.06)} = 15.3921$$

From #1/Section 4: $\ddot{a}_{35} = 15.3926$

matches $\ddot{a}_{35}$ from #1/Section 2 (- round-off error)

2) From 2(b)/Section 3: $\bar{A}_{60} \overset{CF}{=} \frac{\mu}{\mu+\delta} = \frac{.03}{.03+.05} = \frac{.03}{.08} = \frac{3}{8}$

$$\Rightarrow \bar{a}_{60} = \frac{1-\bar{A}_{60}}{\delta} = \frac{1-3/8}{.05} = 12.5$$

From 2/Section 5: $\bar{a}_{60} \overset{CF}{=} \frac{1}{\mu+\delta} = \frac{1}{.03+.05} = \frac{1}{.08} = 12.5$

matches $\bar{a}_{60}$ from 2(b)/Section 3

3) From $^{7(a)}/_{\text{Section 3}}$: $\bar{A}_{40} = .16611$

$$\Rightarrow \bar{a}_{40} = \frac{1 - \bar{A}_{40}}{\delta} = \frac{1 - .16611}{\ln(1.06)} = 14.3111$$

From $^{9(a)}/_{\text{Section 5}}$: $\bar{a}_{40} = 14.3109$

matches $\bar{a}_{40}$ from $^{7(a)}/_{\text{Section 3}}$ (_ round-off error)

4) From 8/Section 2: $A_{35:\overline{17}|} = .38295$

$$\Rightarrow \ddot{a}_{35:\overline{17}|} = \frac{1 - A_{35:\overline{17}|}}{d} = \frac{1 - .38295}{(.06/1.06)} = 10.9012$$

From 6/Section 4: $\ddot{a}_{35:\overline{17}|} = 10.9012$

matches $\ddot{a}_{35:\overline{17}|}$ from 8/Section 2

5) From 4(b)/Section 3: $\bar{A}_{60:\overline{20}|} = .50119$

$$\Rightarrow \bar{a}_{60:\overline{20}|} = \frac{1 - \bar{A}_{60:\overline{20}|}}{\delta} = \frac{1 - .50119}{.05} = 9.9762$$

From 4/Section 5: $\bar{a}_{60:\overline{20}|} = 9.9763$

matches $\bar{a}_{60:\overline{20}|}$ from 4(b)/Section 3 (- round-off error)

6) From 8(a)/Section 3: $\bar{A}_{40:\overline{20}|} = .33605$

$$\Longrightarrow \bar{a}_{40:\overline{20}|} = \frac{1-\bar{A}_{40:\overline{20}|}}{\delta} = 11.3946$$

From 11/Section 5: $\bar{a}_{40:\overline{20}|} = 11.3944$ (– round-off error)

7) From 9/Section 2: $A_{30:40} = .19584$

$$\Rightarrow \ddot{a}_{30:40} = \frac{1 - A_{30:40}}{d} = 14.2068$$

From 10/Section 4: $\ddot{a}_{30:40} = 14.2068$

8) From 10/Section 2: $A_{\overline{30:40}} = .06796$

$$\Rightarrow \ddot{a}_{\overline{30:40}} = \frac{1 - A_{\overline{30:40}}}{d} = 16.4660$$

From 11/Section 4: $\ddot{a}_{\overline{30:40}} = 16.4659$ (– round-off error)

9) From 25(a)/Section 2: $A_{40}^{(4)} = .16491$

$$\Rightarrow \ddot{a}_{40}^{(4)} = \frac{1 - A_{40}^{(4)}}{d^{(4)}} = 14.4363$$

From 20(a)/Section 4: $\ddot{a}_{40}^{(4)} = 14.4364$ (- round-off error)

10) From $^{28(a)}/_{\text{Section 2}}$: $A^{(4)}_{40:\overline{20}|} = .33561$

$$\Rightarrow \ddot{a}^{(4)}_{40:\overline{20}|} = \frac{1 - A^{(4)}_{40:\overline{20}|}}{d^{(4)}} = 11.4854$$

From $^{22}/_{\text{Section 4}}$: $\ddot{a}^{(4)}_{40:\overline{20}|} = 11.4855$ (_ round-off error)

11) (See Video Solution)

From 1/Section 3: $\bar{A}_{x:\overline{n}|} = .72$

$$\Rightarrow \bar{a}_{x:\overline{n}|} = \frac{1-\bar{A}_{x:\overline{n}|}}{\delta} = \frac{1-.72}{.1} = 2.8$$

matches $\bar{a}_{x:\overline{n}|}$ from 1/Section 5

12) From 4/Section 2: ${}_{17|}A_{35} = .09427$

$$\frac{1 - {}_{17|}A_{35}}{d} = 16.0012$$

From 3/Section 4: ${}_{17|}\ddot{a}_{35} = 4.4914 \neq 16.0012$

13) (See Video Solution)

$$APV = 1000\,\ddot{a}_{50} = 11.9915$$

14) $\ddot{a}_{35} = \frac{1 - A_{35}}{d}$

$\Rightarrow {}^{2}\ddot{a}_{35} = \frac{1 - {}^{2}A_{35}}{2d - d^2} \overset{\text{ILT}}{=} 8.7735$

15) (a) $PVRV = Y = 500\,\ddot{Y}_{45}$ $\qquad \ddot{Y}_{45} = \frac{1 - Z_{45}}{d}$

$$Var(Y) = 500^2\, Var(\ddot{Y}_{45}) = 500^2 \cdot \frac{Var(Z_{45})}{d^2} = \left(\frac{500}{d}\right)^2 \left[{}^2A_{45} - (A_{45})^2\right]$$

$$\overset{ILT}{=} \left(\frac{500(1.06)}{.06}\right)^2 \left[.06802 - (.2012)^2\right]$$

$$= 2148772.64$$

(b) $PVRV = Y = 1000\,\ddot{Y}_{50:50}$ $\qquad \ddot{Y}_{50:50} = \frac{1 - Z_{50:50}}{d}$

$$Var(Y) = 1000^2\, Var(\ddot{Y}_{50:50}) = 1000^2 \cdot \frac{Var(Z_{50:50})}{d^2}$$

$$= \left(\frac{1000}{d}\right)^2 \left[{}^2A_{50:50} - (A_{50:50})^2\right]$$

$$\overset{ILT}{=} \left(\frac{1000(1.06)}{.06}\right)^2 \left[.15641 - (.34049)^2\right.$$

$$= 12633184.08$$

16) PVRV $= Y = 2000\,\ddot{Y}_{30:\overline{20}|}$ $\qquad \ddot{Y}_{30:\overline{20}|} = \dfrac{1 - Z_{30:\overline{20}|}}{d}$

$$Var(Y) = 2000^2\, Var(\ddot{Y}_{30:\overline{20}|}) = 2000^2 \cdot \frac{Var(Z_{30:\overline{20}|})}{d^2}$$

$$= \left(\frac{2000}{d}\right)^2 \left[{}^2A_{30:\overline{20}|} - (A_{30:\overline{20}|})^2 \right]$$

$$A_{30:\overline{20}|} = A^1_{30:\overline{20}|} + {}_{20}E_{30}$$

$$\therefore \quad A_{30:\overline{20}|} = A_{30} - {}_{20}E_{30} \cdot A_{50} + {}_{20}E_{30}$$

$$\overset{ILT}{=} .10248 - .29374(.24905) + .29374 = \boxed{1}$$

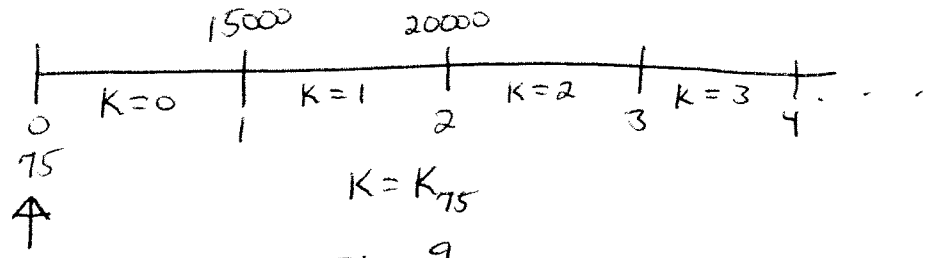
$${}^2A_{30:\overline{20}|} = {}^2A_{30} - {}^2_{20}E_{30}\, {}^2A_{50} + {}^2_{20}E_{30}$$

$$= {}^2A_{30} - v^{20} \cdot {}_{20}E_{30}\, {}^2A_{50} + v^{20}\, {}_{20}E_{30}$$

$$\overset{ILT}{=} .02531 - (1.06)^{-20}(.29374)(.09476) + (1.06)^{-20}(.29374) = \boxed{2}$$

$$\therefore \quad Var(Y) \overset{ILT}{=} \left(\frac{2000(1.06)}{.06}\right)^2 \left[\boxed{2} - (\boxed{1})^2 \right] = 4806654.9$$

17)



$K = K_{75}$

$v = .9$

PVRV = Y

K	Y	Pr
0	0	${}_1q_{75} = .02$
1	$15000v = 13500$	${}_{11}q_{75} = p_{75} \cdot q_{76} = .049$
2+	$15000v + 20000v^2 = 27900$	${}_2p_{75} = 1 - .02 - .049 = .931$

$$E[Y] = 0(.02) + 13500(.049) + 27900(.931) = 26636.4$$

$$E[Y^2] = 0^2(.02) + 13500^2(.049) + 27900^2(.931) = 733629960$$

$$\therefore Var(Y) = E[Y^2] - (E[Y])^2 = 24132155.04$$

18) PVRV = $Y = 1000\,\ddot{Y}_x$ $\qquad \ddot{Y}_x = \frac{1 - Z_x}{d}$

$$Var(Y) = 1000^2\, Var(\ddot{Y}_x) = 1000^2\, \frac{Var(Z_x)}{d^2}$$

$$= \left(\frac{1000}{d}\right)^2 \left[{}^2A_x - (A_x)^2\right]$$

$A_x \overset{CF}{=} \frac{q}{q+i}$ $\qquad q = 1 - p = 1 - e^{-\mu} = 1 - e^{-.03}$

$\delta = \ln(1+i) \Rightarrow i = e^{\delta} - 1 = e^{.05} - 1$

$d = \frac{i}{1+i}$

${}^2A_x \overset{CF}{=} \frac{q}{q + (2i + i^2)}$

$\therefore Var(Y) = 36014453.61$

Note: $A_x \doteq .36566$

${}^2A_x \doteq .21937$

19) (See Video Solution)

$$EPV = 3000\,\ddot{a}_{40}^{(12)}\ \frac{ILT}{CAA}\ 43059.37$$

20) (See Video Solution)

$$EPV = 10000\, A_{30}^{(2)} \quad \underset{3\text{-term WH}}{\overset{ILT}{=}} \quad 1039.83$$