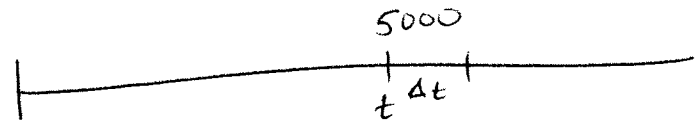
1) $\bar{a}_x = \bar{a}_{x:\overline{n}|} + {}_nE_x \cdot \bar{a}_{x+n}$

$5 = \bar{a}_{x:\overline{n}|} + .55\,(4) \Rightarrow \bar{a}_{x:\overline{n}|} = 2.8$

2) (See Video Solution)



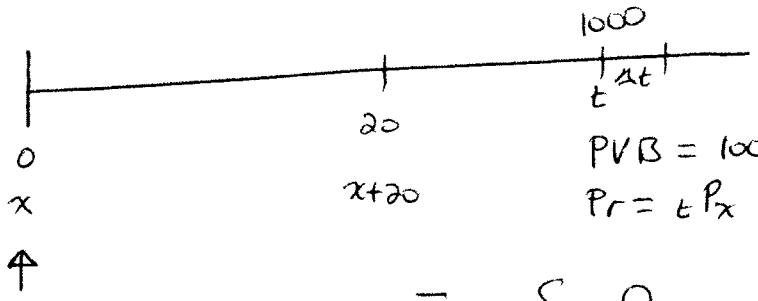
$PVB = 5000\,\Delta t \cdot v^t$

$P_r = {}_tP_x$

$PVRV = Y = 5000\,\bar{Y}_x = 5000\,\bar{a}_{\overline{T}|}$

$EPV = 5000\,\bar{a}_x = 62500$

3)



$PVB = 1000\,\Delta t \cdot v^t$

${}_tP_x = {}_tP_x$

$PVRV = Y = 1000\,{}_{20|}\bar{Y}_x = \begin{cases} 0 & \text{if } T \le 20 \\ 1000 \cdot {}_{20|}\bar{a}_{\overline{T-20}|} & \text{if } T > 20 \end{cases} \qquad T = T_x$

$= 1000 \cdot v^{20} \cdot \bar{a}_{\overline{T-20}|}$

$= 1000\,\bar{a}_{\overline{T}|} - 1000\,\bar{a}_{\overline{20}|}$

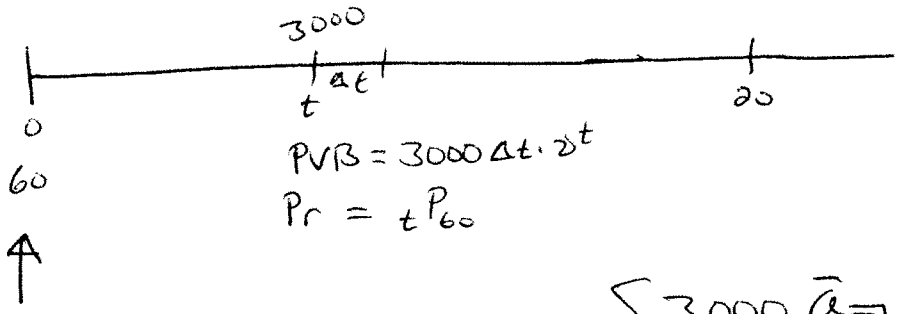
$EPV = 1000\,{}_{20|}\bar{a}_x = 1000\,\bar{a}_{x+20} \cdot {}_{20}E_x$

${}_{20}E_x \overset{CF}{=} e^{-20(\mu+\delta)} = e^{-20(.08)}$

$\bar{a}_{x+20} \overset{CF}{=} \frac{1}{\mu+\delta} = \frac{1}{.08}$

$\therefore EPV = 1000\left(\frac{1}{.08}\right) e^{-1.6} = 2523.71$

4) (See Video Solution)



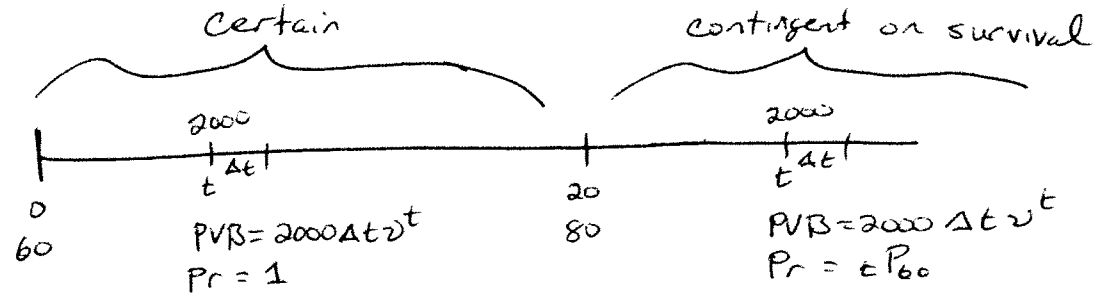
$PVB = 3000\,\Delta t \cdot v^t$

$P_r = {}_tP_{60}$

$$PVRV = Y = 3000\,\bar{Y}_{60:\overline{20}|} = \begin{cases} 3000\,\bar{a}_{\overline{T}|} & \text{if } T \le 20 \\ 3000\,\bar{a}_{\overline{20}|} & \text{if } T > 20 \end{cases}$$

$$EPV = 3000\,\bar{a}_{60:\overline{20}|} = 29928.88$$

5)



$$PVRV = Y = 2000\,\bar{Y}_{\overline{60:\overline{20}|}} = \begin{cases} 2000\,\bar{a}_{\overline{20}|} & \text{if } T \le 20 \\ 2000\,\bar{a}_{\overline{T}|} & \text{if } T > 20 \end{cases} \qquad T = T_{60}$$

$$EPV = 2000\,\bar{a}_{\overline{60:\overline{20}|}} = 2000\,\bar{a}_{\overline{20}|} + 2000 \cdot \underbrace{{}_{20|}\bar{a}_{60}}_{= {}_{20}E_{60} \cdot \ddot{a}_{80}}$$

$$\overset{CF}{=} 2000\,\frac{1 - e^{-20\delta}}{\delta} + 2000\,e^{-20(\mu+\delta)} \cdot \frac{1}{\mu+\delta}$$

$$= 30332.24$$

6) (See Video Solution)

(a) $\bar{a}_x = 10$

$\bar{a}_y = 5$

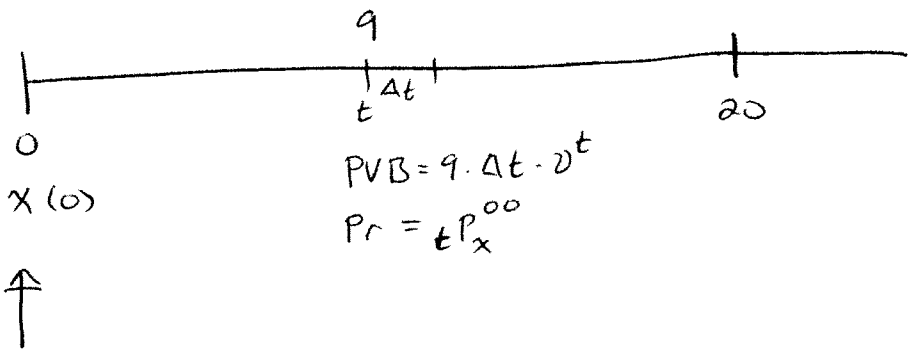
$\bar{a}_{xy} = 4$

$\bar{a}_{\overline{xy}} = 11$

(b) $APV = 48000$

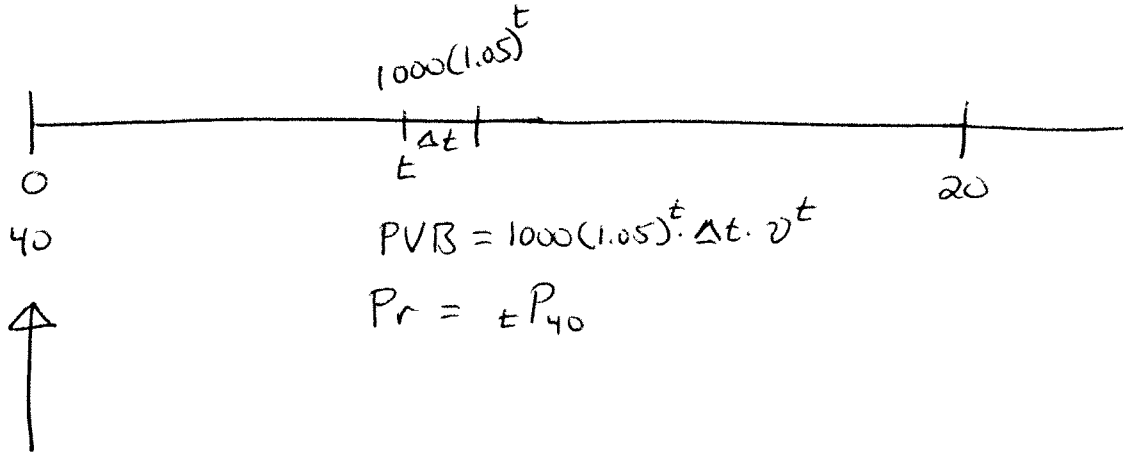
(See Video Solution)

7)



APV = 83.47

8) (See Video Solution)



$APV = 12037.04$

9) $EPV = 1000\,\bar{a}_{40}$

(a) $\bar{a}_{40} \overset{UDD}{=\!=} \alpha(\infty)\,\ddot{a}_{40} - \beta(\infty)$

$\overset{ILT}{=\!=} 1.00028(14.8166) - .50985$

$\Rightarrow EPV = 14310.90$

(b) $\bar{a}_{40} \overset{\substack{3\text{-term}\\ WH}}{=\!=} \ddot{a}_{40} - \frac{1}{2} - \frac{1}{12}(\mu_{40} + \delta)$

$\mu_{40} = -\frac{1}{2}\ln({}_2P_{39}) = -\frac{1}{2}\ln\left(\frac{\ell_{41}}{\ell_{39}}\right)$

$\delta = \ln(1+i)$

$\overset{ILT}{=\!=} 14.8166 - \frac{1}{2} - \frac{1}{12}\left(-\frac{1}{2}\ln\left(\frac{9287264}{9337427}\right) + \ln(1.06)\right)$

$\Rightarrow EPV = 14311.52$

10) $EPV = 1000 \cdot {}_{20|}\bar{a}_{40} = 1000\, {}_{20}E_{40} \cdot \bar{a}_{60}$

${}_{20}E_{40} \overset{ILT}{=} .27414$

(a) $\bar{a}_{60} \overset{UDD}{=} \alpha(\infty)\ddot{a}_{60} - \beta(\infty)$

$\overset{ILT}{=} 1.00028(11.1454) - .50985$

$\Rightarrow EPV = 2916.49$

(b) $\bar{a}_{60} \overset{\text{3-term WH}}{=} \ddot{a}_{60} - \frac{1}{2} - \frac{1}{12}(\mu_{60} + \delta)$

$\mu_{60} = -\frac{1}{2}\ln({}_2P_{59}) = -\frac{1}{2}\ln\left(\frac{l_{61}}{l_{59}}\right)$

$\delta = \ln(1+i)$

$\overset{ILT}{=} 11.1454 - \frac{1}{2} - \frac{1}{12}\left(-\frac{1}{2}\ln\left(\frac{8075403}{8292713}\right) + \ln(1.06)\right)$

$\Rightarrow EPV = 2916.70$

11) (See Video Solution)

$$APV = 1000\,\bar{a}_{40:\overline{20}|} = 11394.41$$

12) $\mathring{e}_{50} \overset{WH}{\underset{3\text{-term}}{\approx}} e_{50} + \frac{1}{2} - \frac{1}{12}(\mu_{50})$

$$\mu_{50} = -\frac{1}{2} \ln({}_2P_{49}) = -\frac{1}{2} \ln\left(\frac{l_{51}}{l_{49}}\right)$$

$$\therefore \mathring{e}_{50} - e_{50} \overset{WH}{\underset{ILT}{\approx}} \frac{1}{2} - \frac{1}{12}\left(-\frac{1}{2}\ln\left(\frac{8897913}{9000057}\right)\right) = .49952$$