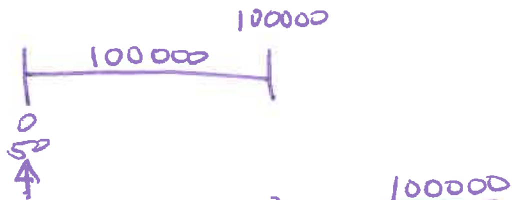
MAP 4176 / 5178 Name:__________________________

Test 3 Date: February 7, 2018

Each problem is worth 10 points. Show all work for full credit, and use correct notation. Simplify answers completely. See other side for additional problems.

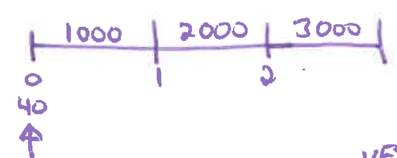
Use ILT actuarial assumptions to determine the APV of the insurance product given.

1. a 1-year discrete endowment insurance of 100,000 issued to (50)



$$APV = 100000\, v = \frac{100000}{1.06} = 94{,}340$$

2. a 3-year term discrete insurance issued to (40), with a benefit of 1000 if death occurs in the first year, 2000 if death occurs in the second year, and 3000 if death occurs in the third year.



$$APV = 1000\cdot (IA)^{1}_{40:\overline{3}|} \overset{VEP}{=} 1000\, v\, q_{40} + 2000\, v^2 \cdot {}_{1|}q_{40} + 3000\, v^3 \cdot {}_{2|}q_{40}$$

$${}_{1|}q_{40} = p_{40} \cdot q_{41}$$

$${}_{2|}q_{40} = {}_{2}p_{40} \cdot q_{42} = p_{40} \cdot p_{41} \cdot q_{42}$$

$$\therefore APV \overset{ILT}{=} 15.926\ldots$$

3. a whole-life discrete insurance of 100 issued on the last-survivor status on independent lives, both age 35; i.e. the benefit is payable at the end of the year of the second death.

$$APV = 100\, A_{\overline{35:35}}$$

$$= 100\left(2\cdot A_{35} - A_{35:35}\right)$$

$$\therefore APV \overset{ILT}{=} 7.05$$

4. a 10-year deferred, 20-year term insurance issued to (25), with a benefit of 1000 paid at the end of the year of death if (25) dies between ages 35 and 55.

$APV_{35} = 1000 \cdot A^{1}_{35:\overline{20|}} = 1000 \cdot (A_{35} - {}_{20}E_{35} \cdot A_{55})$

$APV = {}_{10}E_{25} \cdot APV_{35} = {}_{10}E_{25} \cdot 1000 \cdot (A_{35} - {}_{20}E_{35} \cdot A_{55})$

$\therefore APV \overset{ILT}{=} 22.796\cdots$

Alternative Solution (among many)

$APV = 1000 \cdot A^{1}_{25:\overline{30|}} - 1000 A^{1}_{25:\overline{10|}}$

5. a discrete 10-year endowment insurance of 500 issued on the joint-life status on independent lives, ages 30 and 40.

$APV = 500 \cdot A_{30:40:\overline{10|}} = 500 \cdot (A^{1}_{30:40:\overline{10|}} + {}_{10}E_{30:40})$

$A^{1}_{30:40:\overline{10|}} = A_{30:40} - {}_{10}E_{30:40} \cdot A_{40:50}$

${}_{10}E_{30:40} = (1+i)^{10} \cdot {}_{10}E_{30} \cdot {}_{10}E_{40} \overset{ILT}{=} .526\cdots$ (many other correct ways)

$\therefore APV \overset{ILT}{=} 284$