Name: HW 1.6 Key

1. Which simple interest rate over six years is closest to being equivalent to the following:

   (i) an effective rate of *discount* of 4% for the first year,
   (ii) an effective rate of *discount* of 12% for the second year,
   (iii) an effective rate of *discount* of 5% for the third year,
   (iv) an effective rate of *interest* of 7% for the fourth, fifth, and sixth years?

   [1.h #05]

   A) 8.8% B) 8.9% C) 9.0% D) 9.1% E) 9.2%

$$1+6i = (0.96)^{-1}(0.88)^{-1}(0.95)^{-1}(1.07)^3$$

$$i = \boxed{0.08774}$$

2. What nominal annual discount rate compounded semiannually is equivalent to a nominal rate of interest of 3% compounded monthly? [1.h #06]

   A) At least 2.9%, but less than 3.1%
   B) At least 2.7%, but less than 2.9%
   C) At least 3.1%, but less than 3.3%
   D) At least 3.3%, but less than 3.5%
   E) At least 3.5%, but less than 3.7%

$$\left(1-\frac{d^{(2)}}{2}\right)^{-2} = (1.0025)^{12}$$

$$d^{(2)} = \boxed{0.029739}$$

3. Investment X for 34,000 is invested at a nominal rate of interest, *j*, convertible semiannually. After 7 years, it accumulates to 76,870.73.

   Investment Y for 34,000 is invested at a nominal rate of discount, *k*, convertible quarterly. After 5 years, it accumulates to 45,999.63.

   Investment Z for 34,000 is invested at an annual effective rate equal to *j* in year one and an annual effective rate of discount equal to *k* in year two.

   Calculate the value of investment Z at the end of two years. [1.a(vi-ix) #11]

   A) 40,511 B) 39,903 C) 40,106 D) 40,308 E) 40,713

X: $34{,}000\left(1+\frac{j}{2}\right)^{14} = 76{,}870.73 \rightarrow j = 12\%$

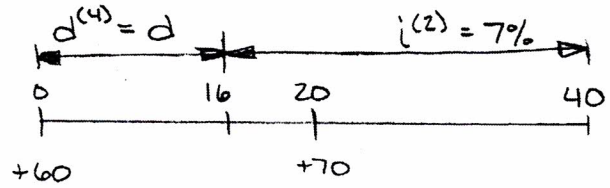
Y: $34{,}000\left(1-\frac{k}{4}\right)^{-20} = 45{,}999.63 \rightarrow k = 6\%$

Z: $34{,}000(1.12)(0.94)^{-1} = \boxed{40{,}510.64}$

4. Jeff deposits 60 into a fund at $t = 0$, and deposits another 70 at $t = 20$. Interest is credited at a nominal discount rate of d compounded quarterly for the first 16 years, and at a nominal interest rate of 7% semiannually thereafter. The accumulated balance at the end of 40 years is 1,000.

Calculate d. [1.a(vi-ix) #02]

[A] 5.2% B) 4.81% C) 4.94% D) 5.07% E) 5.33%



$$60\left(1-\frac{d}{4}\right)^{-64}(1.035)^{48} + 70(1.035)^{40} = 1000$$

$$d = \boxed{5.2\%}$$

5. At time $t = 0$, John deposits 2400 into a fund which credits interest at a nominal interest rate of 6% compounded semiannually. At the same time, he deposits P into a different fund which credits interest at a nominal discount rate of 3% compounded monthly. At time $t = 30$, the amounts in each fund are equal.

What is the annual effective interest rate earned on the total deposits, $2400 + P$, over the 30-year period? [1.a(vi-ix) #08]

[A] 4.24% B) 4.2% C) 4.28% D) 4.32% E) 4.36%

Fund 1: $i^{(2)} = 6\% \rightarrow j = 0.03$

Fund 2: $d^{(12)} = 3\% \rightarrow k = 0.0025$

$$2400(1.03)^{60} = P(0.9975)^{-360} \rightarrow P = 5742.36$$

Balance at $t=30$ (per account) $= 2400(1.03)^{60} = 14,139.85$

Total Deposited $= 2400 + P = 8142.36$

Total Balance at $t=30 = 2 \times 14,139.85 = 28,279.70$

$$8142.36(1+i)^{30} = 28,279.70$$

$$i = \boxed{4.24\%}$$