Name HW 1.5 Key

1. An account earns interest at a nominal annual rate of 22% convertible monthly. Find the equivalent annual effective rate of interest.

[A] 24.36% B) 24.85% C) 25.33% D) 25.82% E) 26.31%

$$(1+i) = \left(1+\frac{0.22}{12}\right)^{12}$$

$$i = \boxed{24.36\%}$$

2. The interest rate on a four year fund varies from year to year, as follows:
   (i) During year 1, the fund earns an effective annual rate of 8%.
   (ii) During year 2, the fund earns a nominal annual rate of 7%, convertible quarterly.
   (iii) During year 3, the fund earns a nominal annual rate of 9%, convertible semiannually.
   (iv) During year 4, the fund earns a nominal annual rate of 5%, convertible every two years.
   Find the effective annual rate of interest over the four year period.

[A] 7.31% B) 6.72% C) 6.87% D) 7.01% E) 7.16%

$$(1+i)^4 = (1.08)(1.0175)^4(1.045)^2(1.10)^{1/2}$$

$$(1+i)^4 = 1.32584$$

$$i = \boxed{7.31\%}$$

3. Brian and Jennifer each take out a loan of X.

Jennifer will repay her loan by making one payment of 1425 at the end of year 6. Brian will repay his loan by making one payment of 1775 at the end of year 6.

The nominal semiannual rate being charged to Jennifer is exactly one-half the nominal semiannual rate being charged to Brian.

Calculate X. [1.a(vi-ix) #05]

[A] 1,139 B) 1,196 C) 1,253 D) 1,310 E) 1,367

Jennifer's semi-annual rate: j

Brian's semi-annual rate: $2j$

J: $X(1+j)^{12} = 1425$

B: $X(1+2j)^{12} = 1775$

$$\frac{(1+j)^{12}}{(1+2j)^{12}} = 0.802817$$

$$1+j = 0.981864(1+2j)$$

$$j = 0.018818$$

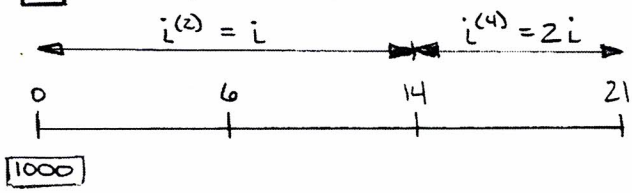
$$X = \frac{1425}{(1+j)^{12}} = \boxed{1139.34}$$

4. Jennifer deposits 1000 into a bank account. The bank credits interest at a nominal annual rate of i convertible semiannually for the first 14 years and at a nominal annual rate of $2i$ convertible quarterly for all years thereafter.

   The accumulated amount in the account at the end of 6 years is X. The accumulated amount in the account at the end of 21 years is 2150.

   Calculate X. [1.a(vi-ix) #06]

   A) 1178 B) 1143 C) 1155 D) 1166 E) 1190



Let $j = \frac{i}{2} = \frac{2i}{4}$

$1000(1+j)^{28}(1+j)^{28} = 2150 \rightarrow j = 1.3763\%$

$X = 1000(1+j)^{12} = \boxed{1178.25}$

5. On January 1, 2000, Jack deposited 1600 in Bank X to earn interest at the rate of j per annum compounded semiannually. On January 1, 2004, he transferred his account to Bank Y to earn interest at the rate of k per annum compounded quarterly. On January 1, 2013, the balance at Bank Y is 4,379.07.

   If Jack could have earned interest at the rate of k per annum compounded quarterly from January 1, 2000 through January 1, 2013, his balance would have been 4,655.09.

   Calculate the ratio k/j. [1.a(vi-ix) #10]

   A) 1.22 B) 1.12 C) 1.17 D) 1.27 E) 1.32

$1600\left(1+\frac{k}{4}\right)^{52} = 4655.09 \rightarrow k = 0.083$

$1600\left(1+\frac{j}{2}\right)^{8}\left(1+\frac{k}{4}\right)^{36} = 4379.07 \rightarrow j = 0.068$

$\frac{k}{j} = \boxed{1.22}$