HW 3.2 (a) Key

1. Iggy borrows X for 12 years at an annual effective rate of 5.5%. If he pays the principal and accumulated interest in one lump sum at the end of 12 years, he would pay 890.50 more in interest than if he repaid the loan with 12 level payments at the end of each year. Calculate X. [6.a #06]

$\boxed{\text{A)}}$ 1,750 B) 1,595 C) 1,645 D) 1,700 E) 1,805

Lump Sum : $FV = X(1.055)^{12}$

Level Payments : $X = R a_{\overline{12|}5.5} \rightarrow R = \frac{X}{a_{\overline{12|}}}$

Total Paid $= \frac{12X}{a_{\overline{12|}}}$

$$X(1.055)^{12} = \frac{12X}{a_{\overline{12|}}} + 890.50$$

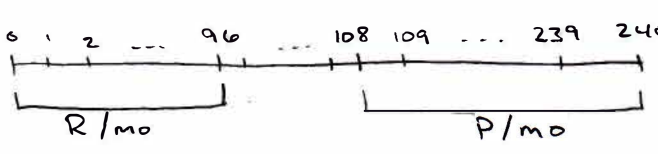
$$X = \boxed{1750}$$

2. Elaine takes out a \$120,000 mortgage on December 1, 2010. Elaine will repay the mortgage over 20 years with level monthly payments at an effective annual interest rate of 4%. The first payment is due January 1, 2011. After making payment number 96, Elaine does not make any new payments for the entire next year. Elaine starts making revised monthly payments, of amount P, beginning January 1, 2020. The amount P is such that Elaine will pay off the loan in the original, 20-year term - that is to say, her last payment will be due December 1, 2030. Determine P. [6.a #15]

$\boxed{\text{A)}}$ At least \$750, but less than \$825
B) At least \$450, but less than \$525
C) At least \$525, but less than \$600
D) At least \$600, but less than \$675
E) At least \$675, but less than \$750

$i = 4\%$ $j = 0.32737\%$

$$120{,}000 = R a_{\overline{240|}j} \rightarrow R = 722.66$$



$$120{,}000 = R a_{\overline{96|}j} + P a_{\overline{132|}j} \cdot v^{108}$$

$$P = \boxed{805.15}$$

3. Bert borrows 140,000 from Friendly Mortgage on January 1, 1993, to be paid in 360 monthly installments at a 6.6% nominal annual interest rate compounded monthly. The first payment is due February 1, 1993. Immediately after payment number 11, Friendly sells the remainder of the loan to Buy-Em-Up Trust for an amount that will yield a 7% annual effective interest rate to Buy-Em-Up. Determine Friendly's effective annual yield over the time that Friendly owns the loan. [6.a #23]

A) At least 4.5%, but less than 5%
B) At least 2.5%, but less than 3%
C) At least 3%, but less than 3.5%
D) At least 3.5%, but less than 4%
E) At least 4%, but less than 4.5%

Bert's Payments: $140{,}000 = R\,a_{\overline{360}|0.55\%} \rightarrow R = 894.12$

Buy-Em-Up's Price: $X = R\,a_{\overline{349}|j} = 136{,}032.69 \quad \left(\begin{matrix} i = 7\% \\ j = 0.5654\% \end{matrix}\right)$

Friendly's Yield: $140{,}000 = R\,a_{\overline{11}|k} + X v_k^{11} \rightarrow k = 0.3860$ [Using BA II]

$i = \boxed{4.73\%}$

4. A loan of 40,000 is being repaid by 20 equal installments made at the end of each year at 5.5% interest effective annually. Immediately after payment number 7, the loan is renegotiated as follows:
(i) The borrower will make 13 annual payments of K to repay the loan, with the first payment made 2 years from the date of renegotiation.
(ii) The interest rate is changed to 7.5% effective annually.
Calculate K. [6.a #31]

A) 4,037 B) 3,795 C) 3,916 D) 4,158 E) 4,279

$40{,}000 = R\,a_{\overline{20}|5.5\%} \rightarrow R = 3347.17$

Outstanding Balance at $t=7$: $B_t = R\,a_{\overline{13}|5.5\%} = 30{,}516.44$

$30{,}516.44 = K\,a_{\overline{13}|7.5\%}\,(1.075)^{-1} \rightarrow K = \boxed{4037}$

5. Rachel buys a house and takes out a $170,000, 30-year mortgage. The interest rate is 4.8% convertible monthly and Rachel makes monthly payments of $700 for the first 6 years. Determine how large her monthly payments need to be for the remaining 24 years in order to pay off the mortgage at the end of the 30-year period. [6.a #37]

A) At least $950, but less than $1,000
B) At least $1,000, but less than $1,050
C) At least $1,050, but less than $1,100
D) At least $1,100, but less than $1,150
E) At least $1,150, but less than $1,200

$170{,}000 = 700\,a_{\overline{72}|0.4\%} + R\,a_{\overline{288}|0.4\%} \cdot v^{72}$

$R = \boxed{985.47}$