HW 3.4 (a) Key

1. Don takes out a 14-year loan of L, which he repays with annual payments at the end of each year using the amortization method. Interest on the loan is charged at an annual effective rate of i. Don repays the loan with a decreasing series of payments. He repays 700 in year 1, 650 in year 2, 600 in year 3, ..., and 50 in year 14. The amount of principal repaid in year 4 is equal to 325. Calculate L. [6.e #03]

[A] 3,320 B) 3,240 C) 3,280 D) 3,360 E) 3,400

$L = 50(Da)_{\overline{14}|i}$

$R_4 = 550 \qquad P_4 = 325 \qquad I_4 = 225$

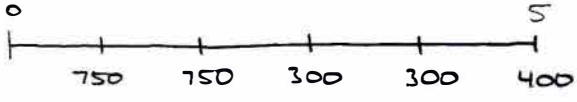
$B_3 = 50(Da)_{\overline{11}|i} \qquad I_4 = 50 \cdot i\,(Da)_{\overline{11}|i} = 225$

$50(11 - a_{\overline{11}|i}) = 225 \rightarrow 50a_{\overline{11}|i} = 325 \rightarrow i = 9.9835\%$

$L = 50(Da)_{\overline{14}|i} = \boxed{3318.82}$

2. A loan is being repaid in five annual payments. The first two payments are \$750. The third and fourth payments are \$300. The final payment is \$400. The annual effective interest rate is 6.5%. Determine the interest portion of the third payment. [6.e #04]

[A] At least \$55, but less than \$60
B) At least \$40, but less than \$45
C) At least \$45, but less than \$50
D) At least \$50, but less than \$55
E) At least \$60, but less than \$65



$i = 6.5\%$

$B_2 = 300v + 300v^2 + 400v^3 = 877.33$

$I_3 = iB_2 = \boxed{57.02}$

3. Nikita takes out a 18-year loan. The loan is repaid by making 18 annual repayments at the end of each year. The first loan repayment is equal to X, with subsequent repayment 3.8% greater than the previous year's repayment. The annual effective interest rate being charged on the loan is 10%. The amount of interest repaid during the first year is equal to 3,785.40. Calculate X. [6.e #05]

[A] 3,622 B) 3,459 C) 3,513 D) 3,567 E) 3,676

$I_1 = 3785.40 = L(0.10) \rightarrow L = 37{,}854$

$i = 10\%$ $k = 3.8\%$ $i' = \frac{0.062}{1.038} = 5.973\%$

$37{,}854 = \frac{X}{1.038} a_{\overline{18}|i'} \rightarrow X = \boxed{3621.57}$

4. Carla borrowed \$190,000 on January 1, 2008. She will make 11 annual payments of \$17,000 to the lender beginning on January 1, 2009. In addition, she will make monthly payments of amount \$$X$ to the lender beginning February 1, 2008, and continuing for 16 years. You may assume that the annual effective interest rate is 7%. Determine the principal outstanding on January 1, 2016, immediately after the two payments due on that date have been made. [6.e #06]

[A] At least \$84,000, but less than \$84,250
B) At least \$84,250, but less than \$84,500
C) At least \$84,500, but less than \$84,750
D) At least \$84,750, but less than \$85,000
E) At least \$85,000, but less than \$85,250

$i = 7\%$ $j = 0.5654\%$

$190{,}000 = 17{,}000\, a_{\overline{11}|i} + X a_{\overline{192}|j}$

$X = 534.60$

$B_8 = 17{,}000\, a_{\overline{3}|i} + X a_{\overline{96}|j}$

$= \boxed{84{,}134.34}$

5. A 23-year loan is repaid by a decreasing annuity of 23, 22, 21, etc. Payments are made at the end of the year. The annual effective rate is 6%. Find the amount of principal included in payment number 12. [6.e #07]

[A] 8.384 B) 8.007 C) 8.132 D) 8.258 E) 8.51

$L = (Da)_{\overline{23}|6\%}$ $\qquad R_{12} = 12$

$B_{11} = (Da)_{\overline{12}|6\%} = 60.27$

$I_{12} = i\, B_{11} = 3.616$

$P_{12} = R_{12} - I_{12} = \boxed{8.384}$