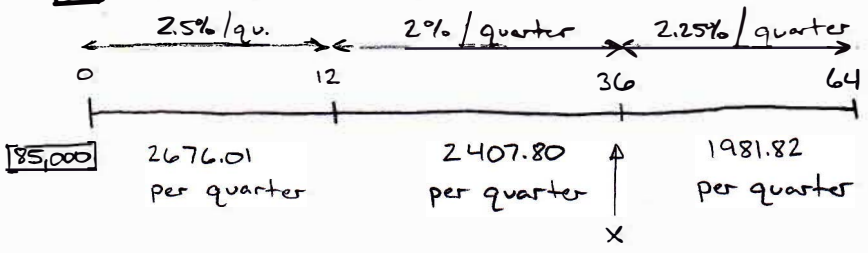
HW 3.2 (b) Key

1. An investor took out a loan of 85,000 at 10% compounded quarterly, to be repaid over 16 years with quarterly payments of 2,676.01 at the end of each quarter. After 12 payments, the interest rate dropped to 8% compounded quarterly. The new quarterly payment dropped to 2,407.80. After 36 payments in total, the interest rate on the loan increased to 9% compounded quarterly. The investor decided to make an additional payment of X at the time of payment number 36. After the additional payment was made, the new quarterly payment was calculated to be 1981.82, payable for 7 more years. Determine X. [6.a #05]

A) 10,400 B) 11,650 C) 12,900 D) 14,140 E) 15,390



$B_{36} = 2407.80\, a_{\overline{28}|2\%} = 51,241.05$

$51,241.05 = X + 1981.82\, a_{\overline{28}|2.25\%} \rightarrow X = \boxed{10,400}$

2. Paul lends 6600 to Peter. Peter agrees to pay it back in 18 annual installments at 6% with the first payment due in one year. After making 5 payments, Peter renegotiates to pay off the debt with 10 additional annual payments. The new payments are calculated so that Paul will get a 4.5% annual yield over the entire 15-year period. Determine how much money Peter saved by renegotiating. [6.a #10]

A) 1,744 B) 1,796 C) 1,849 D) 1,901 E) 1,953

Original Terms: $6600 = R\, a_{\overline{18}|6\%} \rightarrow R = 609.55$

Total Pmt $= 18R = 10,971.96$

New Terms: $6600 = R\, a_{\overline{5}|4.5\%} + Q\, a_{\overline{10}|4.5\%} \cdot (1.045)^{-5}$

$Q = 618$

Total Pmt $= 5R + 10Q = 9227.75$

$10,971.96 - 9227.75 = \boxed{1744.21}$

3. Jeff obtains a mortgage loan of 5,000 to be repaid with monthly payments at the end of each month over n years. Each monthly payment is 43.74, based on a nominal interest rate of i compounded monthly, $i > 0$. Jeff is unable to make the first payment, but makes all the other payments on time. Since he skipped the first payment, he owes 241.52 at the end of n years. Calculate i. [6.a #42]

A) 8.61% B) 8.1% C) 8.28% D) 8.43% E) 8.79%

$5000 = 43.74\, a_{\overline{12n}|j}$

AV of Missed Pmt $= 241.52 = 43.74(1+j)^{12n} \rightarrow v^{12n} = 0.1811$

$5000 = 43.74 \dfrac{1 - v^{12n}}{j} \rightarrow j = 0.00716 \rightarrow i^{(12)} = \boxed{8.596\%}$

4. Humphrey purchases a 130,000 home. Mortgage payments are to be made monthly for 30 years, with the first payment to be made one month from now. The annual effective rate of interest is 8%. After 9 years, the amount of each payment is increased by 374.38 in order to repay the mortgage more quickly. Calculate the amount of interest paid over the duration of the loan. [6.a #49]

A) 142,300 B) 132,500 C) 135,800 D) 139,000 E) 145,600

$[\, i = 8\% \quad j = 0.6434\% \,]$

Orginal Pmt: $130{,}000 = R\, a_{\overline{360}|j} \rightarrow R = 928.72$

$B_{108} = 928.72\, a_{\overline{252}|j} = 115{,}670$

$115{,}670 = (928.72 + 374.28)\, a_{\overline{n}|j} \rightarrow n = 132$

$I = 928.72(108) + 1303(132) - 130{,}000 = \boxed{142{,}297.76}$

5. Jones borrowed \$16,000 to be repaid in 28 equal payments at the end of each year. At the time of the loan, the annual effective rate of interest was 7%, but immediately after payment number 10, the annual effective rate of interest changed to 8% for the remainder of the loan. Jones is allowed to continue paying the loan with the same annual payment as long as he immediately makes a payment of less than \$100 to reduce the principal such that the loan will end up on integral number of years with no balloon or fractional payment. What is the amount of the small payment made immediately after level payment number 10? [6.a #51]

A) At least \$54, but less than \$56
B) At least \$48, but less than \$50
C) At least \$50, but less than \$52
D) At least \$52, but less than \$54
E) At least \$56, but less than \$58

$16{,}000 = R\, a_{\overline{28}|7\%} \rightarrow R = 1318.27$

$B_{10} = 1318.27\, a_{\overline{18}|7\%} = 13{,}260.60$

$13{,}260.60 = X + 1318.27\, a_{\overline{n}|8\%}$

$X = 13{,}260.60 - 1318.27\, a_{\overline{n}|8\%}$

(Using "Table" in TI-30XS)

$X < 100 \Rightarrow n = 21 \Rightarrow \boxed{X = 55.75}$