Chapter 3 Understanding Money Management

3.1) (a)

$$r = 1.5\% \times 12 = 18\%$$

(b)

$$i_a = (1+0.015)^{12} - 1 = 19.56\%$$

3.2)

- Nominal interest rate:

$$r = 0.95\% \times 12 = 11.40\%$$

- Effective annual interest rate:

$$i_a = (1+0.0095)^{12} - 1 = 12.01\%$$

3.3) Assume a continuous compounding:

$$r = 7.55\%$$
$$i_a = 7.842\%$$
$$i_a = e^r - 1 = e^{0.0755} - 1 \approx 0.07842$$

3.4) $Given: P = \$400, A = \$26.61, N = 16$ weeks,

$$\$400 = \$26.61(P/A, i, 16)$$

Solve by Excel Goal Seek for $i = 0.74385\%$ per week

(a) Nominal interest rate:

$$r = 0.74385\% \times 52 = 38.6802\%$$

(b) Effective annual interest rate:

$$i_a = (1+0.0074385)^{52} - 1 = 47.0159\%$$

3.5) Effective interest rate per payment period:

$$\$1080 = \$1000(1+i)$$
$$i = 8\% \text{ per week}$$

(a) Nominal interest rate:

$$r = 8\% \times 52 = 416\%$$

(b) Effective annual interest rate:

$$i_a = (1 + 0.08)^{52} - 1 = 5{,}370.6\%$$

3.6)

$$\$15{,}000 = \$493.93(P/A, i, 36)$$
$$(P/A, i, 36) = 30.3686$$

Use Excel to calculate i:

$$i = 0.95\% \text{ per month}$$
$$r = 0.95 \times 12 = 11.4\%$$

3.7)

$$\$16{,}000 = \$517.78(P/A, i, 36)$$
$$(P/A, i, 36) = 30.901155$$
$$i = 0.85\% \text{ per month}$$
$$r = 0.85 \times 12 = 10.2\%$$

3.8)

$$\$20{,}000 = \$922.90(P/A, i, 24)$$
$$(P/A, i, 24) = 21.6708$$
$$i = 0.8333\%$$
$$APR = 0.8333\% \times 12 = 10\%$$

3.9)

$$\$24{,}000 = \$583.66(P/A, i, 48)$$
$$(P/A, i, 48) = 41.1198$$
$$i = 0.65\%$$
$$i_a = (1 + 0.0065)^{12} - 1$$
$$= 8.085\%$$

3.10)

a) $i = (1 + \frac{0.09}{12})^{1} - 1 = 0.75\%$

b) $i = (1 + \frac{0.09}{12})^{3} - 1 = 2.267\%$

c) $i = (1 + \frac{0.09}{12})^{6} - 1 = 4.585\%$

d) $i = (1 + \frac{0.09}{12})^{12} - 1 = 9.381\%$

3.11)

$$i = (1 + \frac{0.09}{12})^3 - 1 = 2.267\%$$

3.12)

$$i = e^{\frac{0.06}{12}} - 1 = 0.501\%$$

3.13) What will be the amount accumulated by each of these present investments?

(a)

$$F = \$4{,}500(F / P, 4.5\%, 20) = \$10{,}852.71$$

(b)

$$F = \$8{,}500(F / P, 2\%, 60) = \$27{,}888.76$$

(c)

$$F = \$18{,}600(F / P, 0.5\%, 84) = \$28{,}278.88$$

3.14) (a)

$$F = \$5{,}000(F / A, 4\%, 20) = \$148{,}890.39$$

(b)

$$F = \$9{,}000(F / A, 2\%, 24) = \$273{,}796.76$$

(c)

$$F = \$3{,}000(F / A, 0.75\%, 168) = \$1{,}003{,}554.24$$

3.15) (a)

$$A = \$15{,}000(A / F, 4\%, 20) = \$504$$

(b)

$$A = \$2{,}000(A / F, 1.5\%, 60) = \$20.79$$

(c)

$$A = \$48{,}000(A / F, 0.6125\%, 60) = \$664.4$$

3.16) (a)

$$P = \$1{,}000(P / A, 4.5\%, 20) = \$13{,}007.94$$

(b)

$$P = \$7{,}000(P / A, 2\%, 20) = \$114{,}459.8$$

(c)

$$P = \$6,000(P/A, 0.75\%, 96) = \$409,550.63$$

3.17)

- Equivalent future worth of the receipts:

$$F_W = \$1,500(F/P, 2\%, 2) + \$1,500(F/P, 2\%, 4) + \$1,500(F/P, 2\%, 6) + \$2,500$$
$$= \$7,373.5$$

- Equivalent future worth of deposits:

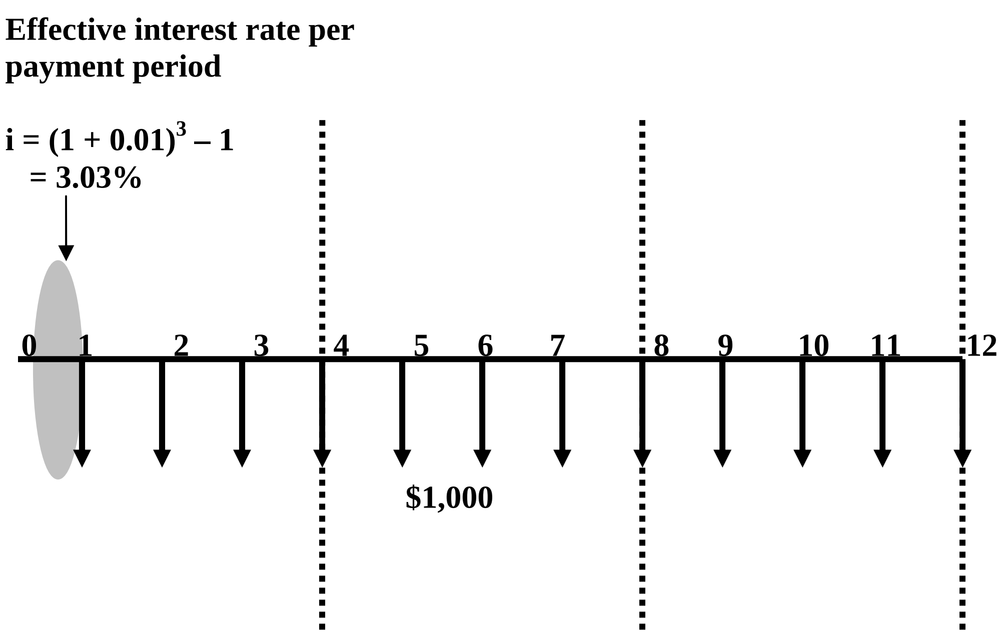
$$F_D = C(F/A, 2\%, 8) + C(F/P, 2\%, 8)$$
$$= 9.7547C$$

Letting $F_W = F_D$ and solving for C yields

$$C = \$755.89$$

3.18) (d)

$$i_{\text{quarter}} = (1 + \frac{0.12}{12})^3 - 1 = 3.03\% \text{ per quarter}$$



3.19) (d)

3.20)

$$A = \$50,000(A/F, 0.5\%, 24)$$
$$= \$1,966.03$$

3.21)

- The balance just before the transfer:

$$F_9 = \$3,000(F/P, 0.5\%, 108) + \$4,000(F/P, 0.5\%, 72)$$
$$+\$6,000(F/P, 0.5\%, 48)$$
$$= \$18,492.21$$

Therefore, the remaining balance after the transfer will be $\$18,492.21 \times (\frac{1}{2}) = \$9,246.1$. This remaining balance will continue to grow at 6% interest compounded monthly. Then, the balance 6years after the transfer will be

$$F_{15} = \$9,246.11(F/P, 0.5\%, 72)$$
$$= \$13,240.84$$

- The funds transferred to another account will earn 8% interest compounded quarterly. The resulting balance 6 years after the transfer will be

$$F_{15} = \$9,246.11(F/P, 2\%, 24)$$
$$= \$14,871.79$$

3.22) Establish the cash flow equivalence at the end of 25 years. Referring A to his quarterly deposit amount, we obtain the following:

$$i_a = (1 + \frac{0.08}{4})^4 - 1 = 8.243\%$$
$$A(F/A, 2\%, 100) = \$53,000(P/A, 8.243\%, 10)$$
$$312.2323A = \$351,769.13$$
$$A = \$1,126.63$$

3.23)

$$\$100,000 = \$1,000(P/A, 9\%/12, N)$$
$$(P/A, 0.75\%, N) = 100$$
$$N = 185.53 \text{ months or } 15.46 \text{ years}$$

3.24) Given: r = 6% per year compounded quarterly, N = 60 quarterly deposits, date of last deposit = date of first withdrawal of $50,000, four withdrawals. We can calculate i = 1.5% per quarter compounded quarterly and $i_a = (1+\frac{0.06}{4})^4 - 1 = 6.136\%$. To find A, the amount of quarterly deposit,

$$A(F/A, 1.5\%, 60) = \$50,000 + \$50,000(P/A, 6.136\%, 3)$$
$$A = \$183,314/96.2147$$
$$= \$1,905.26$$

3.25) Setting the equivalence relationship at the end of 15 years gives

$$i_{sa} = (1+\frac{0.08}{2\cdot 2})^2 - 1 = 4.04\%$$
$$A(F/A, 2\%, 60) = \$45,000(P/A, 4.04\%, 10)$$
$$114.0515A = \$364,266$$
$$A = \$364,266/114.0515$$
$$= 3,193.87$$

3.26) Given i = 6%/12 = 0.5% per month,

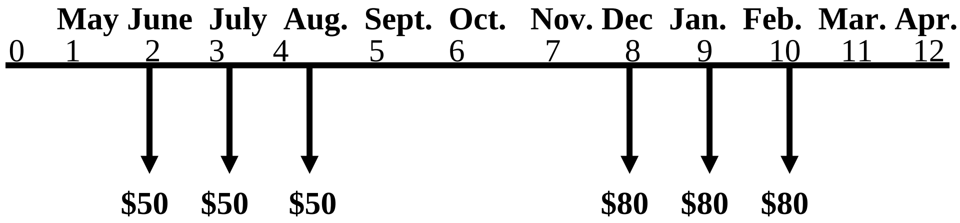
$$A = \$500,000(A/P, 0.5\%, 60)$$
$$= \$9,650$$

3.27) First compute the equivalent present worth of the energy cost during the first operating cycle:

$$P = \$50(P/A, 0.75\%, 3)(P/F, 0.75\%, 1) + \$80(P/A, 0.75\%, 3)(P/F, 0.75\%, 7)$$
$$= \$371.08$$

Then, compute the total present worth of the energy cost over 5 operating cycles.

$$P = \$371.08 + \$371.08(P/F, 0.75\%, 12) + \$371.08(P/F, 0.75\%, 24)$$
$$+ \$371.08(P/F, 0.75\%, 36) + \$371.08(P/F, 0.75\%, 48)$$
$$= \$1,563.27$$



3.28)

- Option 1

$$i = (1 + \frac{.06}{4})^1 - 1 = 1.5\%$$
$$F = \$1,000(F/A, 1.5\%, 40)(F/P, 1.5\%, 60) = \$132,587$$

- Option 2

$$i = (1 + \frac{.06}{4})^4 - 1 = 6.136\%$$
$$F = \$6,000(F/A, 6.136\%, 15) = \$141,110$$

- Option 2 – Option 1 = $141,110 – 132,587 = $8,523

- Select (b)

3.29) Given: r = 7% compounded daily, N = 25 years

- Since deposits are made at year end, find the effective annual interest rate:

$$i_a = (1 + 0.07/365)^{365} - 1 = 7.25\%$$

- Then, find the total amount accumulated at the end of 25 years:

$$\begin{aligned} F &= \$3,250(F/A, 7.25\%, 25) + \$150(F/G, 7.25\%, 25) \\ &= \$3,250(F/A, 7.25\%, 25) + \$150(P/G, 7.25\%, 25)(F/P, 7.25\%, 25) \\ &= \$297,016.95 \end{aligned}$$

3.30) Given:

$$3 = (1+i)^N$$
$$\log 3 = N \log(1+i)$$
$$N = \log 3 / \log(1+i)$$

(a)

$$i = (1+0.0225)^4 - 1 = 9.31\% : N = 12.34 \text{ years}$$

(b)

$$i = (1+0.09/12)^{12} - 1 = 9.38\% : N = 12.25 \text{ years}$$

(c)

$$i = e^{0.09} - 1 = 9.42\% : N = 12.21 \text{ years}$$

3.31) (a)

$$i_q = (1+\frac{0.09}{4})^1 - 1 = 2.25\%$$
$$P = \$3{,}000(P/A, 2.25\%, 60) = \$98{,}247$$

(b)

$$i_q = (1+\frac{0.09}{4 \cdot 3})^3 - 1 = 2.2669\%$$
$$P = \$3{,}000(P/A, 2.2669\%, 60) = \$97{,}857.9$$

(c)

$$i_q = e^{\frac{0.09}{4}} - 1 = 2.2755\%$$
$$P = \$3{,}000(P/A, 2.2755\%, 60) = \$97{,}661.1$$

3.32)

$$i = e^{0.07} - 1 = 7.251\%$$
$$F = A(F/A, i, N)$$
$$= \$2{,}000(F/A, 7.251\%, 8)$$
$$= \$20{,}706$$

3.33) Given: A = \$1,000, N = 80 quarters, r = 8% per year

(a)

$$F = \$1{,}500(F/A, 2\%, 80) = \$290{,}658$$

(b)

$$F = \$1,500(F\ /\ A, 2.0133\%, 80) = \$292,546.5$$

(c)

$$F = \$1,500(F\ /\ A, 2.020\%, 80) = \$293,503.35$$

3.34)

$$i = e^{0.085/4} - 1 = 2.1477\%$$
$$A = \$15,000(A / P, 2.1477\%, 16)$$
$$= \$1,117.5$$

3.35) (a)

$$F = \$5,000(F\ /\ A, 0.7444\%, 72)$$
$$= \$474,014.38$$

(b)

$$F = \$5,000(F\ /\ A, 0.75\%, 72)$$
$$= \$475,035.14$$

(c)

$$F = \$5,000(F\ /\ A, 0.75282\%, 72)$$
$$= \$475,550.21$$

3.36) Nominal interest rate per quarter = 8%/4 = 2%
Effective interest rate per quarter $= e^{0.02} - 1 = 2.020\%$

$$A = \$20,000(A / P, 2.020\%, 20)$$
$$= \$1,226$$

3.37)

$$i = e^{0.0975/4} - 1 = 2.4675\%$$
$$P = \$1,500(P\ /\ A, 2.4675\%, 20) = \$23,455.65$$

3.38) Equivalent present worth of the series of equal quarterly payments of $3,000 over 10 years at 8% compounded continuously:

$$i = e^{0.02} - 1 = 2.02013\%$$
$$\$3,000(P\ /\ A, 2.02013\%, 40) = \$81,777.6$$

Equivalent future worth of \$81,777.6 at the end of 15 years:

$$i_a = e^{0.08} - 1 = 8.3287\%$$
$$V_{15} = \$81,777.6(F/P, 8.3287\%, 15) = \$271,511$$

3.39)

- Effective interest rate for Bank A

$$i = (1 + \frac{0.18}{4})^4 - 1 = 19.252\%$$

- Effective interest rate for Bank B

$$i = (1 + \frac{0.175}{365})^{365} - 1 = 19.119\%$$

- Select (c)

3.40) (a)

- Bank A: $i_a = (1 + 0.0155)^{12} - 1 = 20.27\%$ per year
- Bank B: $i_a = (1 + 0.195/12)^{12} - 1 = 21.34\%$ per year

(b) Given $i = 6\%/365 = 0.01644\%$ per day, find the total cost of credit card usage for each bank over 24 months. We first need to find the effective interest rate per payment period (month—30 days per month):

$$i = (1 + 0.0001644)^{30} - 1 = 0.494\%$$

- Monthly interest payment:

Bank A: $\$300(0.0155) = \$4.65$/month

Bank B: $\$300(\frac{0.195}{12}) = \$4.875$/month

We also assume that the \$300 remaining balance will be paid off at the end of 24 months.

- Bank A:

$$P = \$20 + \$4.65(P/A, 0.494\%, 24) + \$20(P/F, 0.494\%, 12)$$
$$= \$143.85$$

- Bank B:

$$P = \$4.13(P/A, 0.494\%, 24) = \$93.25$$

Select Bank B

3.41) Loan repayment schedule: $A = \$20,000(A/P, 0.75\%, 48) = \$497.90$

End of month	Interest Payment	Repayment of Principal	Remaining Balance
0	$0.00	$0.00	$20,000.00
1	$150.00	$347.90	$19,652.10
2	$147.39	$350.51	$19,301.59
3	$144.76	$353.14	$18,948.45
4	$142.11	$355.79	$18,592.67
5	$139.44	$358.46	$18,234.21
6	$136.76	$361.14	$17,873.07

3.42) Given: P = $150,000, N = 360 months, i = 0.75% per month

(a)

$$A = \$150,000(A/P, 0.75\%, 360) = \$1,200$$

(b) If r = 9.75% APR after 5 years, we want to find new annual amount A:
i = 0.8125% per month.
First, find the remaining balance at the end of 60 months:

$$B_{60} = \$1,200(P/A, 0.75\%, 300) = \$142,993.92$$

Then, find the new monthly payments:

$$A = \$142,993.92(A/P, 0.8125\%, 300) = \$1,274.27$$

3.43) (a) **1.** $\$14,000(A/P, 0.75\%, 24)$

(b) **3.** $B_{12} = A(P/A, 0.75\%, 12)$

3.44) Based on effective monthly compounding-Given i = 9.25%/365= 0.02534% per day, and N = 48 months:

$$i = (1 + 0.0002534)^{30} - 1$$
$$= 0.763075\%$$
$$A = \$7,000(A/P, 0.763075\%, 48)$$
$$= \$175 \text{ per month}$$
$$I = \$175 \times 48 - \$7,000$$
$$= \$1,400$$

3.45) Given: P = \$15,000, r = 9% per year compounded monthly, N= 36 months, i = 0.75% per month:

$$A = P(A/P, 0.75\%, 36)$$
$$= \$15,000(0.0318)$$
$$= \$477$$

To find payoff balance immediately after 20th payment:

$$B_{20} = \$477(P/A, 0.75\%, 16)$$
$$= \$477(15.0243)$$
$$= \$7,166.59$$

3.46) Given i = 8.5%/12 per month, and N = 180 months,

$$A = \$210,000(A/P, 0.7083\%, 180)$$
$$= \$2,067.90$$

3.47) Given: P = \$350,000, N = 240 months, i = 0.75% per month:

$$A = \$350,000(A/P, 0.75\%, 240)$$
$$= \$3,150$$

- Total payment:

$$\$3,150 \times 60 = \$189,000$$

- Remaining balance at the end of 5 years (60 months):

$$\$3,150(P/A, 0.75\%, 180) = \$310,569.21$$

- Reduction in principal:

$$\$350,000 - \$310,569.21 = \$39,430.79$$

• Interest payment:

$$\$189,000 - \$39,430.79 = \$149,569.21$$

3.48) Given: purchase price = $300,000, down payment = $45,000, N = 360 months, and i = 0.75% per month:

$$A = \$255,000(A/P, 0.75\%, 360)$$
$$= \$2,051.79$$

To find minimum acceptable monthly salary:

$$\text{Monthly salary} = \frac{A}{0.25}$$
$$= \frac{\$2,051.79}{0.25}$$
$$= \$8,207.16$$

3.49) Given: purchase price = $180,000, down payment (sunk equity) = $30,000, i = 0.75% per month, and N = 360 months,

• Monthly payment:

$$A = \$150,000(A/P, 0.75\%, 360)$$
$$= \$1,200$$

• Balance at the end of 5 years (60 months):
:

$$B_{60} = \$1,200(P/A, 0.75\%, 300)$$
$$= \$142,993.92$$

• Realized equity = sales price – balance remaining – sunk equity:

$$\$205,000 - \$142,993.92 - \$30,000 = \$32,006.1$$

The $32,006.1 represents the net gains (before tax) from the transaction.

3.50) Given: i = 0.75% per month, mortgages' for families A, B and C have identical remaining balances prior to the 20th payment = $100,000, find interest on 20th payment for A, B, and C. With equal balances, all will pay the same interest.

$$\$100,000(0.0075) = \$750$$

3.51) Given: loan amount = \$130,000, points charged = 3%, N = 360 months, i = 0.75% per month, actual amount loaned \$130,000(0.97) = \$126,100:

$$\begin{aligned} A &= \$130,000(A/P, 0.75\%, 360) \\ &= \$1,040 \end{aligned}$$

To find the effective interest rate on this loan

$$\begin{aligned} \$126,100 &= \$1,040(P/A, i, 360) \\ i &= 0.7732\% \text{ per month} \\ r &= 0.7732\% \times 12 = 9.2784\% \\ i_a &= (1+0.007732)^{12} - 1 = 9.683\% \text{ per year} \end{aligned}$$

3.52) (a)

$$\begin{aligned} \$44,000 &= \$6,600(P/A, i, 5) + \$2,200(P/G, i, 5) \\ i &= 6.913745\% \end{aligned}$$

(b)

$$\begin{aligned} \text{Amount borrowed} &= \$44,000 \\ \text{Total payment made} &= \$6,600 + \$8,800 + \$11,000 \\ &\quad + \$13,200 + \$15,400 \\ &= \$55,000 \\ \text{Interest payment} &= \$55,000 - \$44,000 \\ &= \$11,000 \end{aligned}$$

Period	Beginning Balance	Interest Payment	Repayment	Ending Balance
1	\$44,000.00	\$3,042.05	(\$6,600.00)	\$40,442.05
2	\$40,442.05	\$2,796.06	(\$8,800.00)	\$34,438.11
3	\$34,438.11	\$2,380.96	(\$11,000.00)	\$25,819.08
4	\$25,819.08	\$1,785.07	(\$13,200.00)	\$14,404.14
5	\$14,404.14	\$995.87	(\$15,400.00)	\$0.00
		\$11,000.01	(\$55,000.00)	

3.53) (a)

Amount of dealer financing = \$18,400(0.90) = \$16,560

$$A = \$16,560(A/P, 1.125\%, 48) = \$448.38$$

(b)

Assuming that the remaining balance will be financed over 44 months,

$$B_4 = \$448.38(P/A, 1.125\%, 44) = \$15,493.71$$
$$A = \$15,493.71(A/P, 1.02083\%, 44) = \$438.88$$

(c)

- Interest payment to the dealer:

$$I_{\text{dealer}} = \$448.38 \times 4 - (\$16,560 - \$15,493.71) = \$727.23$$

- Interest payment to the credit union:

$$\text{Total payment } = \$438.88(44) = \$19,310.72$$
$$I_{\text{credit}} = \$19,310.72 - \$15,493.71 = \$3,817.01$$

- Total interest payment:

$$I = \$727.23 + \$3,817.01 = \$4,544.24$$

3.54)

- The monthly payment to the bank: Deferring the loan payment for 6 months is equivalent to borrowing

$$\$4,800(F/P, 1\%, 6) = \$5,095.20$$

To pay off the bank loan over 36 months, the monthly payment would be

$$A = \$5,095.20(A/P, 1\%, 36) = \$169.16 \text{ per month}$$

- The remaining balance after making the 16th payment:

$$B_{16} = \$169.16(P/A, 1\%, 20) = \$3,052.59$$

- The loan company will pay off this remaining balance and will charge \$104 per month for 36 months. To find the effective interest rate for this new transaction, we set up the following equivalence relationship and solve for *i*:

$$\$3{,}052.59 = \$104(P/A, i, 36)$$
$$(P/A, i, 36) = 29.3518$$
$$i = 1.1481\%$$
$$r = 1.1481\% \times 12 = 13.78\% \text{ per year}$$
$$i_a = \left(1 + \frac{0.1378}{12}\right)^{12} - 1 = 14.68\%$$

3.55)

$$\$15{,}000 = A(P/A, 0.667\%, 12) + A(P/A, 0.75\%, 12)(P/F, 0.667\%, 12)$$
$$= A(11.4958) + A(11.4349)(0.9234)$$
$$= 22.05479A$$
$$A = \$680.12$$

3.56) Given: i = 1% per month, deferred period = 6 months, N = 36 monthly payments, first payment due at end of month 7, the amount of initial loan = $12,000

(a) Find the monthly payment to the furniture store: first, find the loan adjustment for deferred period

$$\$12{,}000(F/P, 1\%, 6) = \$12{,}738$$

Find the monthly payments based on this adjusted loan amount

$$A = \$12{,}738(A/P, 1\%, 36) = \$422.90$$

(b) Find the remaining balance after the 26th payment. Since there are 10 payments outstanding,

$$B_{26} = \$422.90(P/A, 1\%, 10) = \$4{,}005.41$$

(c) Find the effective interest rate:

$$\$4{,}005.41 = \$204(P/A, i, 30)$$
$$i = 2.9866\% \text{ per month}$$
$$r = 2.9866\% \times 12 = 35.84\% \text{ per year}$$
$$i_a = (1 + 0.029866)^{12} - 1 = 42.35\% \text{ per year}$$

3.57) Given: Purchase price = $18,000, down payment = $1,800, monthly payment (dealer financing) = $421.85, N = 48 end-of-month payments:

(a) Given: i = 11.75%/12 = 0.97917% per month

$$\begin{aligned} A &= \$16,200(A/P, 0.97917\%, 48) \\ &= \$16,200(0.0262) \\ &= \$424.44 \end{aligned}$$

(b) Using dealer financing, find *i*:

$$\begin{aligned} \$421.85 &= \$16,200(A/P, i, 48) \\ i &= 0.95\% \text{ per month} \\ r &= 0.95\% \times 12 = 11.4\% \text{ per year} \\ i_a &= \left(1 + \frac{0.114}{12}\right)^{12} - 1 = 12.015\% \end{aligned}$$

3.58)

- 24-month lease plan:

$$\begin{aligned} P &= (\$2,500 + \$520) + \$500 + \$520(P/A, 0.5\%, 23) \\ &- \$500(P/F, 0.5\%, 24) \\ &= \$13,884.13 \end{aligned}$$

- Up-front lease plan:

$$\begin{aligned} P &= \$12,780 + \$500 - \$500(P/F, 0.5\%, 24) \\ &= \$12,836.4 \end{aligned}$$

Select the single up-front lease plan.

3.59) Given: purchase price = \$85,000, down payment = \$17,000

- Option 1: i = 10%/12= 0.8333% per month, N =360 months

- Option 2: For the assumed mortgage,

$$P_1 = \$35,394,\ i_1 = 8.5\%/12 = 0.70833\% \text{ per month},$$
$$N_1 = 300 \text{ months},\ A_1 = \$285 \text{ per month};$$

For the second mortgage,

$$P_2 = \$32,606,\ i_2 = 1\% \text{ per month}; \quad N_2 = 120 \text{ months}$$
$$A_2 = \$32,606(A/P, 1\%, 120) = \$466.27$$

(a) For the second mortgage, the monthly payment will be

$$\$68,000 = \$285(P/A,i,300) + \$466.27(P/A,i,120)$$
$$i = 0.805\% \text{ per month}$$
$$r = 0.805\% \times 12 = 9.66\% \text{ per year}$$
$$i_a = (1+0.00805)^{12} - 1 = 10.10\% \text{ per year}$$

(b) Monthly payments:

- Option 1:

$$A_1 = \$68,000(A/P,0.8333\%,360) = \$596.75$$

- Option 2:

$285 + $466.27= $751.27 for 120 months, then $285 for remaining 180 months

(c) Total interest payment for each option:

- For Option 1: $146,826.99
- For Option 2: $50,108.14 + $23,529.22 = $73,637.36

(d) Equivalent interest rate:

$$\$596.27(P/A,i,360) = \$285(P/A,i,300) + \$466.27(P/A,i,120)$$
$$i = 0.9114\% \text{ per month}$$
$$r = 0.9114\% \times 12$$
$$= 10.9368\% \text{ per year}$$
$$i_a = (1+0.009114)^{12} - 1 = 11.50\% \text{ per year}$$

3.60)

No answers given, but refer to the article by Formato, Richard A., "Generalized Formula for the Periodic Payment in a Skip Payment Loan with Arbitrary Skips," The Engineering Economist, Vol. 37, No. 4; p. 355, Summer 1992

3.61) If you left the $15,000 in your savings account, the total balance at the end of 48 months at 8% interest compounded monthly would be

$$F_I = \$15,000(F/P,8\%/12,48) = \$20,635$$

The earned interest during this period is then

$$I = \$20,635 - \$15,000 = \$5,635$$

Now if you borrowed $15,000 from the dealer at interest 11% compounded monthly over 48 months, the monthly payment would be

$$A = \$15,000(A/P, 11\%/12, 48) = \$388$$

You can easily find the total interest payment over 48 months under this financing by

$$I = (\$388 \times 48) - \$15,000 = \$3,624$$

It appears that you save about $2,011 in interest ($5,635 - $3,624). However, reasoning this line neglects the time value of money for the portion of principal payments. Since your money is worth 8%/12 interest per month, you may calculate the total equivalent loan payment over the 48-month period. This is done by calculating the equivalent future worth of the loan payment series.

$$F_{II} = \$388(F/A, 8\%/12, 48) = \$21,863.77$$

Now compare F_I with F_{II}. The dealer financing would cost $1,229 more in future dollars at the end of the loan period.

3.62) (a) $A = \$60,000(A/P, 13\%/12, 360) = \$664$

(b)

$$\begin{aligned} \$60,000 = {} & \$522.95(P/A, i, 12) \\ & + \$548.21(P/A, i, 12)(P/F, i, 12) \\ & + \$574.62(P/A, i, 12)(P/F, i, 24) \\ & + \$602.23(P/A, i, 12)(P/F, i, 36) \\ & + \$631.09(P/A, i, 12)(P/F, i, 48) \\ & + \$661.24(P/A, i, 300)(P/F, i, 60) \end{aligned}$$

Solving for *i* by trial and error yields

$$i = 1.0028\%$$
$$i_a = (1 + 0.010028)^{12} - 1 = 12.72\%$$

Comments: With Excel, you may enter the loan payment series and use the IRR(range, guess) function to find the effective interest rate. Assuming that the loan amount (-$60,000) is entered in cell A1 and the following loan repayment series in cells A2 through A361, the effective interest rate is found with a guessed value of 11.5/12%:

$$= IRR(A1 : A361, 0.95833\%) = 0.010028$$

(c) Compute the mortgage balance at the end of 5 years:

- Conventional mortgage:

$$B_{60} = \$664(P/A, 13\%/12, 300) = \$58,873.84$$

- FHA mortgage (not including the mortgage insurance):

$$B_{60} = \$635.28(P/A, 11.5\%/12, 300) = \$62,498.71$$

(d) Compute the total interest payment for each option:

- Conventional mortgage(using either Excel or Loan Analysis Program at the book's website—http://www.prenhall.com/park):

$$I = \$178,937.97$$

- FHA mortgage:

$$I = \$163,583.28$$

(e) Compute the equivalent present worth cost for each option at $i = 6\%/12 = 0.5\%$ per month:

- Conventional mortgage:

$$P = \$664(P/A, 0.5\%, 360) = \$110,749.63$$

- FHA mortgage including mortgage insurance:

$$\begin{aligned} P &= \$522.95(P/A, 0.5\%, 12) \\ &\quad + \$548.21(P/A, 0.5\%, 12)(P/F, 0.5\%, 12) \\ &\quad + \$574.62(P/A, 0.5\%, 12)(P/F, 0.5\%, 24) \\ &\quad + \$602.23(P/A, 0.5\%, 12)(P/F, 0.5\%, 36) \\ &\quad + \$631.09(P/A, 0.5\%, 12)(P/F, 0.5\%, 48) \\ &\quad + \$661.24(P/A, 0.5\%, 300)(P/F, 0.5\%, 60) \\ &= \$105,703.95 \end{aligned}$$

The FHA option is more desirable (least cost).

3.63) Given: Contract amount = \$4,909, A = \$142.45, N = 42 months, and SUM = (42)(43)/2 = 903

(a)

$$\$142.45 = \$4,909(A/P, i, 42)$$
$$i = 0.9555\% \text{ per month}$$
$$i_a = (1 + 0.009555)^{12} - 1 = 12.088\% \text{ per year}$$

(b)

$$APR = 0.9555\% \times 12 = 11.466\%$$

(c) Rebate factor:

$$\begin{aligned}\text{rebate factor} &= 1 - \frac{42+41+40+\cdots+35}{903} \\ &= 1 - 308/903 \\ &= 0.6589\end{aligned}$$

(d) Verify the payoff using the Rule of 78th :

$$\begin{aligned}B_7 &= \$4,909 + \$25 - (\$142.45)(7) \\ &\quad + \$1,048.90\frac{(42+41+\cdots+35)}{903} \\ &= \$4,934 - \$997.15 + \$357.76 \\ &= \$4,294.61\end{aligned}$$

(e) Compute payoff using $(P/A,i,N)$:

$$\begin{aligned}B_7 &= \$142.45(P/A, 0.9555\%, 35) \\ &= \$4,220.78\end{aligned}$$

3.64)

No answers given, but refer to the website and the document

http://www.studentaid.ed.gov/students/attachments/funding/PerkinsLoanInfo.pdf.