1. **(35 p)**
Suppose you deposit $1,000 at the end of each quarter for 5 years at an interest of **12% compounded weekly**. What equal end-of-year deposit over 5 years would accumulate the same amount at the end of 5 years under the same interest compounding (12%, compounded weekly)?

![Diagram showing quarterly deposits and withdrawals.](image.png)

2. **(30 p)** For the quarterly cash flow transactions shown below, determine the amount of money in the account at the end of year 3 if the rate is **8% compounded semiannually**. Assume that deposits and withdrawal cash flows start to earn/charge interest immediately.

<table>
<thead>
<tr>
<th>End of Quarter</th>
<th>Amount of Deposit, $/Quarter</th>
<th>Amount of Withdrawal, $/Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>2-4</td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1000</td>
<td>2600</td>
</tr>
<tr>
<td>11</td>
<td>-</td>
<td>1000</td>
</tr>
</tbody>
</table>

3. **(35 p)** You are considering buying a home for $200,000.
   a) If you make a down payment of $50,000 and take out a mortgage on the rest of the money at **9% compounded monthly**, what will be your monthly payment to retire the mortgage in 10 years?
   b) Consider the 25th payment. How much will the interest and principal payments be?
1. Given: deposit frequency=$1000 per quarter
\[ r = 12\% \text{ compounded weekly} \]
\[ N = 20 \text{ quarters} \]
Find: Equivalent annual deposit amount \((A)\)
\(i_p\) should be determined according to the payment period \((K=4)\) of the first cash flow by considering compounding weekly \((C = \frac{M}{K} = \frac{52}{4} = 13)\) with the following equation:
\[
(i_p) = \left(1 + \frac{r}{M}\right)^C - 1 = \left(1 + \frac{0.12}{52}\right)^{13} - 1 = 0.03042(3.04\%) \]
Second cash flow is based on equal end-of-year deposit over 5 years \((K=1, C = M = 52)\) with the same interest compounding. \(i_a\) effective annual interest should be determined as follows:
\[
(i_a) = \left(1 + i_p\right)^K - 1 = \left(1 + \frac{r}{M}\right)^M - 1 = \left(1 + \frac{0.12}{52}\right)^{52} - 1 = 0.1273(12.73\%) \]
\(A\) can be calculated by equating the present worth of the first cash flow to the present worth of the second cash flow:
\[
$1000\left(P/A, 3.04\%, 20\right) = A\left(P/A, 12.73\%, 5\right) \]
From Table 3.4 (Textbook/Park 4th ed.):
\[
$1000\left(\frac{(1 + 0.0304)^20 - 1}{0.0304(1 + 0.0304)^20}\right) = A\left(\frac{(1 + 0.1273)^5 - 1}{0.1273(1 + 0.1273)^5}\right) \]
\(A = 4186.55\)

2. Given: quarterly cash flow on the table, \(r = 8\% \text{ compounded semiannually} (K=4, M=2, C=M/K=2/4=1/2=0.5), N=3 \text{ years} \)
Find: \(F\)
Convention in terms of the account: Deposits (+), Withdrawals(-)
First effective interest rate per payment period \((i_p)\) should be determined from the following equation:
\[
(i_p) = \left[1 + \frac{r}{CK}\right]^C - 1 = \left[1 + \frac{0.08}{2}\right]^{1/2} - 1 = 0.01980(1.98\%) \]
Note that there are quarterly cash flows (as deposits and withdrawals) given in the table. The first one is a single deposit amount (+$900) at the period 1 (1st Quarter). The second one is the +$700 equal (uniform) deposit series (Period:2-4) and the third one is also a single deposit amount (+$1000) at the period 7. As for withdrawals, the first one is a single withdrawal amount (-$2600) at the period 7 (7th Quarter). The second one is a single withdrawal amount (-$1000) at the period 11 (11th Quarter). Also we are looking for an equivalent value of these deposits and withdrawals at the end of year 3 (end of period 12).
\[ F = \$900\left(\frac{F}{P},0.198\%,1\right) + \$700\left(\frac{F}{A},1.98\%,3\right)\left(\frac{F}{P},0.198\%,8\right) + \$1000\left(\frac{F}{P},0.198\%,5\right) - \$2600\left(\frac{F}{P},0.198\%,5\right) - \$1000\left(\frac{F}{P},0.198\%,1\right) \]

\[ F = \$900\left(1 + 0.0198\right)^{11} + \$700\left[\frac{(1 + 0.0198)^3}{0.0198} - 1\right]\left(1 + 0.0198\right)^{8} + \$1000\left(1 + 0.0198\right)^{5} - \$2600\left(1 + 0.0198\right)^{5} - \$1000\left(1 + 0.0198\right) \]

\[ F = \$837.62 \]

(Formula : Table 3.4)

3. a) 
Given:

\[ P = \$200000 - \$50000 = \$150000; r = 9\%; C = 1, M = K = 12 \]

\[ N = 120 \]

Find : \( A \)

\[ A = P\left(\frac{A}{P},i_c,N\right) = i_p = \frac{r}{M} = 0.09\frac{12}{12} = 0.0075(0.75\% \text{ effective interest rate per compounding/payment}) \]

\[ A = \$150000\left(\frac{A}{P},0.75\%,120\right) = \$150000(0.0127); Table / p.872 \]

\[ A = \$1905 \]

b) For the period 25 (n=25); Principal payment \( (P_n) \) and interest payment \( (I_n) \) will be calculated based on the ending balance of the previous period \( (B_{n-1}) \) as follows:

\[ B_{25} = A\left(\frac{P}{A},0.75\%,120-24\right) = A\left(\frac{P}{A},0.75\%,96\right) = \left(\$1905\right)(68.2584) = \$130032.25 \]

\[ B_n = A\left(\frac{P}{A},0.75\%,N-n\right) I_n = (B_{n-1})t; P_n = A - I_n \]

\[ I_{25} = B_{24}i_c = \left(\$130032.25\right)(0.0075) = \$975.24 \]

\[ P_{25} = A - I_{25} = \$1905 - \$975.24 = \$929.76 \]