Problem 1) (10 points) Determine the monthly payment required if you want to borrow $30,000 from a bank to buy a car, at 6% interest for 6 years.

Problem 2) (20 points) For the previous car loan, when you hand the bank your check for the 24th monthly payment, how much of that check is interest, and how much is going toward principal reduction?

Problem 3) (10 points) How much total interest will you end up paying for the previous car loan?

Problem 4) (20 points) Calculate the internal rate of return (to the nearest value available in your reference manual – no interpolation required) for the following 15 year project. The project will initially cost $30,000, and will pay back nothing for the first 5 years. It will thereafter pay back $6000/year at the end of each year for the next 10 years.

Problem 5) (20 points) I have just handed the 12 year U.S. Treasury bond shown to the buyer. He insisted that he get 8% return on his investment, to which I reluctantly agreed. How much did he pay me for this bond? As you see, some of the coupons have already been redeemed.

Problem 6) (20 points) I need a truck to haul dirt on a 5 year project. I can:

1) Buy a truck for $30,000, payable when I pick up the truck. If I buy the truck, I have to pay for the repairs which are estimated at $4000/year, payable at the end of the first year and at the end of each year thereafter. At the end of the 5th year, I would sell the truck.

2) Or I can lease the truck for $10,000/year, for 5 years, the first lease payment due when I pick up the truck, and at the beginning of the year, and each year thereafter. If I lease the truck, the leasing company pays for repairs. When I return the truck to them at the end of the project, I get nothing. It just becomes their truck.

a) Calculate the breakeven point for how much I would have to get for the truck at the end of the project, for the two alternatives to break even, if my MARR is 6%.

b) If the truck sold for $7000, should I buy or lease the truck?
Problem 1) (20 points) I need a truck to haul dirt on a 5 year project. I can:

1) Buy a truck for $40,000, payable when I pick up the truck. If I buy the truck, I have to pay for the repairs which are estimated at $4000/year, payable at the end of the first year and at the end of each year thereafter. At the end of the 5th year, I would sell the truck.
2) Or I can lease the truck for $10,000/year, for 5 years, the first lease payment due when I pick up the truck, and at the beginning of the year, and each year thereafter. If I lease the truck, the leasing company pays for repairs. When I return the truck to them at the end of the project, I get nothing. It just becomes their truck.

a) Calculate the breakeven point for how much I would have to get for the truck at the end of the project, for the two alternatives to break even, if my MARR is 6%.
b) If the truck sold for $7000, should I buy or lease the truck?

<table>
<thead>
<tr>
<th>U.S TREASURY BOND</th>
</tr>
</thead>
<tbody>
<tr>
<td>6% Yield</td>
</tr>
<tr>
<td>Face Value = $10,000</td>
</tr>
</tbody>
</table>

Problem 2) (20 points) I have just handed the 14 year U.S. Treasury bond shown to the buyer. He insisted that he get 4% return on his investment, to which I readily agreed. How much did he pay me for this bond? As you see, some of the coupons have already been redeemed.

Problem 3) (10 points) Determine the monthly payment required if you want to borrow $40,000 from a bank to buy a car, at 12% interest for 6 years.

Problem 4) (20 points) For the previous car loan, when you hand the bank your check for the 24th monthly payment, how much of that check is interest, and how much is going toward principal reduction?

Problem 5) (10 points) How much total interest will you end up paying for the previous car loan?

Problem 6) (20 points) Calculate the internal rate of return (to the nearest value available in your reference manual – no interpolation required) for the following 15 year project. The project will initially cost $15,000, and will pay back nothing for the first 5 years. It will thereafter pay back $3000/year at the end of each year for the next 10 years.
1a) \[ 30,000 = A \left( \frac{F/A, 0.5\%, 72}{1 + 0.005} \right)^{72} - 1 \\]

\[ \text{Switched} = A \left( \frac{F/A, 0.5\%, 72}{0.005(1 + 0.005)} \right)^{72} \]

\[ = A (1.432 - 1) \]

\[ = \frac{60,339.514}{0.005(1.432)} \]

\[ A = 497.19/\text{month} \rightarrow \$5000 \]

1b) \[ \frac{12\%}{12} = 1\% \]

\[ \Rightarrow 3b) \quad 40,000 = A \left( \frac{F/A, 1\%, 72}{1.01(1.01)} \right)^{72} \]

\[ = A (1.01)^{72} - 1 \]

\[ \frac{1.15039}{0.01(1.01)} = A \]

\[ A = 782.01/\text{month} \]
2a) \[ A = \$497.19 \]

\[ F = 30,000 + 497.19 \left( \frac{P}{A}, 0.5\%, 23 \right) + F \left( \frac{P}{F}, 0.5\%, 23 \right) \]

\[ F = \frac{30,000 - 497.19(21.6757)}{0.8916} \]

\[ F = \$21,560 \]

So for next check you will owe interest on \$21,560 of

\[ \text{interest} = 21560 \times 0.005 = \$107.80 \text{ interest} \]

The rest will be reduction of principal

\[ \$497.19 - \$107.80 = \$389.39 \text{ principal} \]

2b) \[ A = \$40,000 \]

\[ F = 40,000 + 782.01 \left( \frac{P}{A}, 1\%, 23 \right) + F \left( \frac{P}{F}, 1\%, 23 \right) \]

\[ F = \frac{40,000 - 782.01(20.458)}{0.7954} \]

\[ F = \$24003.36 \]

Interest on a \$30,177.72 loan @1%/month

\[ \text{Interest} = \$301.78 \]

Principal = \$782.01 - \$301.78

\[ = \$480.23 \]
Alternate Solution

\[ A = 497.19 \]

\[ F_{24} = 30000 - 497.19 \left( \frac{F}{A}, 0.5\%, 24 \right) \times F(\frac{F}{A}, 0.5\%, 24) \]

\[ F_{24} = 21,169.92 \]

\[ 0 = 30,000 - 497.19 (22,562.9) - F_{24}(0.8872) \]

\[ F_{24} = 21,169.92 \]

So reduction in principal = 21,169.92 - 21,560.

= 390.00

So interest = 497.19 - 390.00 = $107
3a) Total Interest = \$497.19 \times \frac{72}{12} - \$30,000
= \$5797.68

3b) Total Interest = \$782.01 \times \frac{72}{12} - \$40,000
= \$16304.72

\rightarrow 1F \text{ found } \{F = A\left(\frac{72}{12}, 1.5\%\right)\} - 30,000 = \text{interest paid}
4a) \[ A = 3 \]

\[ 30 = A \left( \frac{P/A}{1} \right) \times 10 \left( \frac{P/F}{1} \times 5 \right) \]

<table>
<thead>
<tr>
<th>( \times )</th>
<th>30</th>
<th>( 6(P/A, x, 10) )</th>
<th>( 6(P/F, x, 5) )</th>
<th>( 6(P/A, x, 10)(P/F, x, 5) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>6%</td>
<td>30</td>
<td>6(7.3601)</td>
<td>0.7473</td>
<td>33.00</td>
</tr>
<tr>
<td>8%</td>
<td>30</td>
<td>6(6.7101)</td>
<td>0.6806</td>
<td>27.40</td>
</tr>
<tr>
<td>6 - 8%</td>
<td>( 100 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7%</td>
<td>( 70 )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4b) \( 6 - 8\% \)

\( \Rightarrow 6 - 7\% \)
5a) $A = 10,000$

\[ P = 6000 + 6000\left(\frac{P}{A}, 8\%, 3\right) + 10,000\left(\frac{P}{F}, 8\%, 3\right) \]
\[ = 6000 + 6000(2.5771) + 10,000(0.7938) \]
\[ P = \$10,084.20 \]

5b) $P = 6000 + 6000\left(\frac{P}{A}, 4\%, 3\right) + 10,000\left(\frac{P}{F}, 4\%, 3\right) \]
\[ = 6000 + 6000(2.775) + 10,000(0.889) \]
\[ P = \$11,155.00 \]
**Option 1:**

Break-even point, MARR = 6%

Cost\(_a\) = \(30,000 + 4,000\)\(P/F, 6\%, 5\)\(F(\text{P/F, 6\%, 5})\)

\[= 30,000 + 4,000 \times 4.2124 - F(0.7473)\]

\[= 46,800.00\]

Cost\(_b\) = \(10,000 + 4,000\)\(P/(1 + \text{MARR})\)

\[= 10,000 \times 3.4651\]

\[= 44,651.00\]

\[\therefore \text{Cost}_a = \text{Cost}_b = 46,800.00 - 0.7473F = 44,651.00\]

\[F = \$2942.06\]

**Option 2:**

**b) if F = $1000, buy or lease?**

Cost\(_a\) = \(41,618.50\)

Cost\(_b\) = 44,651.00

\[\therefore \text{Cost}_a < \text{Cost}_b \rightarrow \text{buy}\]

**a) Cost\(_a\) = 40,000 + 4,000\(4.2124\) - \(F(0.7473)\) \[\rightarrow F = \$1,323\]

**b) Cost\(_a\) = 51,618.5 > Cost\(_b\) \rightarrow \text{Lease}\]
Break even: Buy or Lease

\[ \text{Cost}_A = 30,000 + 4000(P/A, 0.06, 5) - F(P/F, 0.06, 5) \]
\[ = 30,000 + 4000(4.2124) - F(0.7473) \]
\[ = 46849.60 - 0.7473F \]

\[ \text{Cost}_B = 10000 + 10000(P/A, 0.06, 4) \]
\[ = 10000 + 10000(3.4651) \]
\[ = 46849.60 - 0.7473F \]
\[ F = 2942 \]
I need a truck to haul dirt. I can either buy the truck for $100,000 or lease it for $10,000 a year, paid at the beginning of the year. If I buy the truck, I will sell it at the end of the year for $30,000. If the project succeeds, the maintenance will cost me $4,000 a year, and the leasing company will pay for all repairs. If I lease the truck, the leasing company will pay for all repairs and will return the truck at the end of the project.

If I buy the truck, I will sell it for $15,000 at the end of the 5th year.

What should I do? My MARR is 6%.

\[
\begin{align*}
\text{If buy:} & \\
\text{Cost} & = 10,000 + 10,000 (PA, 4%, 6\%) + 40,000 \left( P/A, 6\%, 5\right) - F \left( P/F, 6\%, 5\right) \\
& = 10,000 + 3,4651 (10,000) + 30,000 + 4000 (4.2124) - F \left( 0.7473 \right) \\
& = 44,651 \\
\end{align*}
\]

Cost = \$46,849.60 - \$ (0.7473)

\[
\begin{align*}
\text{If lease:} & \\
\text{Cost} & = 10,000 + 40,000 (PA, 6\%, 5\%) - F \left( P/F, 6\%, 5\right) \\
& = 56,849.60 - F \left( 0.7473 \right) \\
\end{align*}
\]

\[
\begin{align*}
\text{If buy:} & \\
F & = \$2942 \\
\text{If lease:} & \\
F & = \$16,323 \checkmark \\
\end{align*}
\]

(a) Buy
(b) Lease