Math100 Solutions to Homework 12

4 C # 50, 52, 54, 97
4 D # 24, 34, 36, 38

4C A 50
APR: 6.25%
PMT: $50 per month \Rightarrow n = 12
Y = 40 years (age 65 - age 25)
Accumulated amount = ?

\[ A = \text{PMT} \times \left[ \frac{(1 + \frac{\text{APR}}{n})^{(nY)}}{(\frac{\text{APR}}{n})} \right] \]

\[ = 50 \times \left[ \frac{(1 + \frac{0.0625}{12})^{(12 \times 40)}}{\left(\frac{0.0625}{12}\right)} \right] \]

\[ = \frac{555.19}{0.00521} = 106,562.38 \]

4B 50
PMT = $200 per month \Rightarrow n = 12
APR = 4.5%
Y = 18 years.

\[ A = \text{same formula as above} = 200 \times \left[ \frac{(1 + \frac{0.045}{12})^{(12 \times 18)}}{\frac{0.045}{12}} \right] \]

\[ A = \frac{24.9}{0.00375} = 66,400 \]

Total deposits: 200 \times 12 \times 18 = $43,200

66,400 - 43,200 = $23,200 interest
#54

\[ A = \$2 \text{ million} \]
\[ y = 3.0 \text{ years} \]
\[ APY = 6\% \]
\[ n = 12 \]
\[ PMT = ? \]

Same formula but solve for \( PMT \)

\[ 2,000,000 = PMT \times \frac{\left(1 + \frac{.06}{12}\right)^{\left(12 \times 30\right)} - 1}{\frac{.06}{12}} \]

\[ \frac{2,000,000}{\frac{1004.52}{1004.52}} = PMT \Rightarrow PMT = \$1991. \]

per month

#57

\[ y = 30 \text{ years} \]
\[ \text{want} \quad \$100,000 \text{ per year when you retire} \]
\[ APY = 6\% \]
How can you do it?

If I have \( A \) dollars at the back in 30 years, then I can live on its interest. I want to have

\[ A \times \frac{6}{100} = \$100,000 \]

So I need \( A = 1,666,667 \) dollars in the bank.

In order to have \( 1,666,667 \) dollars how much should I deposit every month?

\[ 1,666,667 = PMT \times \frac{\left(1 + \frac{.06}{12}\right)^{\left(12 \times 30\right)} - 1}{\frac{.06}{12}} \]

\[ 1,666,667 = PMT \times 1004.52 \Rightarrow PMT = \$1659. \]

dollars per month
AD 24) borrow $15,000 at an APR of 9%
monthly payments of $190 in 10 years.

a) loan principal 15,000
    APR 9% = .09
    12 payments per year
    loan terms: $190 for 10 years

b) # payments 12 x 10 = 120
   total amount 120 x 190 = 22,800

c) $15,000 goes toward the principal,
   22,800 - $15,000 = $7,800 goes toward interest

34) P = $100,000 loan principal = P
    Y = 30 years
    n = 12 (monthly)
    APR = 7%

Find PMT

\[
PMT = \frac{P \times \left(\frac{APR}{n}\right)}{\left[1 - (1 + \frac{APR}{n})^{-nY}\right]}\]

a) \[
PMT = \frac{100,000 \times \left(\frac{.07}{12}\right)}{1 - (1 + \frac{.07}{12})^{-12 \times 30}} = 9669.30\]

b) 665.30 x 12 x 30 = 239,508

c) $100,000 goes toward principal
   $139,508 goes toward interest
36) Student loan $24,000, fixed APR of 8% for 15 years.
- Make a table for the first 3 months.

Monthly payments:
\[
\frac{24,000 \times 0.08}{12} \div \left(1 - \left(1 + \frac{0.08}{12}\right)^{-15 \times 12}\right) = \$229.36
\]

<table>
<thead>
<tr>
<th>Month</th>
<th>Interest ( \frac{0.08}{12} \times \text{Balance} )</th>
<th>Payment toward principal</th>
<th>New principal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month 1</td>
<td>( \frac{0.08}{12} \times 24,000 = 160 )</td>
<td>229.36 - 160 = 69.36</td>
<td>24,000 - 69.36 = 23,306</td>
</tr>
<tr>
<td>Month 2</td>
<td>( \frac{0.08}{12} \times \text{Month } 1 \text{ balance} = 159.54 )</td>
<td>229.36 - 159.54 = 69.82</td>
<td>23,306 - 69.82 = 23,236.18</td>
</tr>
<tr>
<td>Month 3</td>
<td>( \frac{0.08}{12} \times \text{Month } 2 \text{ balance} = 159.072 )</td>
<td>229.36 - 159.072 = 70.29</td>
<td>23,236.18 - 70.29 = 23,165.89</td>
</tr>
</tbody>
</table>

38) $4000 (borrow) & you can afford $150 monthly payment.

Three choices of loan:
- a) 8% APR over 2-years
- b) 9% APR over 3-years
- c) 10% APR over 4-years

Which one would you choose?

a) \[
\frac{4000 \times \left( \frac{0.08}{12} \right)}{1 - \left(1 + \frac{0.08}{12}\right)^{-2 \times 12}} = \$180.91
\]
b) \[
\frac{4000 \times \left( \frac{0.09}{12} \right)}{1 - \left(1 + \frac{0.09}{12}\right)^{-3 \times 12}} = \$177.20
\]
c) \[
\frac{4000 \times \left( \frac{0.10}{12} \right)}{1 - \left(1 + \frac{0.10}{12}\right)^{-4 \times 12}} = \$101.45
\]