Formulas Involving Interest

- **Simple Interest Formula:** If a principal of \( P \) dollars is borrowed for a period of \( t \) years at a per annum interest rate \( r \) (expressed as a decimal), the interest \( I \) charged is

\[
I = Prt
\]

- **Compound Interest Formula:** The amount (in the account) \( A \) after \( t \) years due to a principal \( P \) invested at an annual interest rate \( r \) (expressed as a decimal) compounded \( n \) times per year is

\[
A = P\left(1 + \frac{r}{n}\right)^{nt}
\]

- **Continuous Compounding**

The amount (in the account) \( A \) after \( t \) years due to a principal \( P \) invested at an annual interest rate \( r \) (expressed as a decimal) compounded continuously is

\[
A = Pe^{rt}
\]

- **Effective Rate of Interest:** is the equivalent annual simple interest rate that would yield the same amount as compounding \( n \) times per year (or continuously) after 1 year.

<table>
<thead>
<tr>
<th>Compounding Period</th>
<th>number of times a year you compound</th>
<th>( n )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annually</td>
<td>Once per year</td>
<td>1</td>
</tr>
<tr>
<td>Semianually</td>
<td>Twice per year</td>
<td>2</td>
</tr>
<tr>
<td>Quarterly</td>
<td>Four times per year</td>
<td>4</td>
</tr>
<tr>
<td>Monthly</td>
<td>Twelve times per year</td>
<td>12</td>
</tr>
<tr>
<td>Daily</td>
<td>365 times per year*</td>
<td>365</td>
</tr>
</tbody>
</table>
1. Find the amount that results from $200 invested at 3%, compounded monthly for 4 years.

2. Find the amount that results from $100 invested at 5%, compounded continuously for 1.5 years.

3. Find the Principal needed to get $500 after 2 years at 9%, compounded quarterly.

4. Find the Principal needed to get $85 after 1 year at 6.3%, compounded continuously.

5. What interest rate, compounded annually does it take to double an investment in 8 years?

6. How long does it take for an investment to triple in value if it is invested at 9% compounded semiannually?

7. How long does it take for an investment to triple in value if it is invested at 9% compounded continuously?