**Math 1090 ~ Business Algebra**

Section 5.2 Simple and Compound Interest

**Objectives:**
- Differentiate between simple and compound interest.
- Solve problems involving simple and compound interest.
- Understand and calculate annual percentage yield (APY).

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**Simple and Compound Interest**

**Simple Interest**
- add same interest every period
- arithmetic sequence
- balance is the sum
- \( P = \) principal = start value
- \( Pr = \) principal times interest rate

\[
S = P + Pr(t)
\]

\[
S = P(1 + rt)
\]

- \( P = \) principal
- \( r = \) annual interest rate
- \( t = \) number of years
- \( S = \) future account value

**Compound Interest**
- multiply by same rate every period
- geometric sequence
- balance is the sum
- \( P = \) Principal = start value
- \( (1 + r) = \) factor that's multiplied by principal every year

\[
S = P(1+r)^t
\]

If we compound \( n \) times per year,

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

Continuous compounding

\[
S = Pe^{rt}
\]
Ex 1: If $10,000 is invested for four years at an annual rate of 8%, how much will the account be worth at the end of four years?
a) simple interest  b) compounded once a year

Ex 2: What is an account worth in 8 years if we started with $3000 and we got continuous compounding at a rate of 6%?

Ex 3: If $1000 is invested at 5% annual interest rate, compute these.

<table>
<thead>
<tr>
<th></th>
<th>balance after 5 years</th>
<th>how long to double investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>simple interest</td>
<td></td>
<td></td>
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<tr>
<td>compound interest, n = 1</td>
<td></td>
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<tr>
<td>compound interest, n = 12</td>
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</tbody>
</table>
Ex 4: What amount must be invested now in order to have
$1,000,000 for retirement in 45 years if money is compounded
quarterly at 9%?

\[ \text{APY (Annual Percentage Yield)} \]

Let \( P = 100 \) be invested at 8% interest compounded as given in (a)
and (b). What is the account worth after one year?
a) quarterly  \hspace{1cm} b) monthly

\[ \text{APY} = \left(1 + \frac{r}{n}\right)^n - 1 \]  \hspace{1cm} \text{(periodic compounding)}

\[ \text{APY} = e^r - 1 \]  \hspace{1cm} \text{(continuous compounding)}

Ex 5: Which is a better investment deal?
a) 10% compounded annually

b) 9.8% compounded quarterly

c) 9.65% compounded continuously