2-5

COMPOUND INTEREST FORMULA

OBJECTIVES

Compute interest income using the compound interest formula.
Compute the Annual Percentage Yield (APY)

You will need:
• Student Notes
• Textbook
• Calculator
• Notebook Paper
• Pen or Pencil
No Ear Buds!!!!

Cell Phones: Down & Dark
In the last section we learned that the advantage of a compound interest account is that you earn more interest income.

Is there an easier way to find the amount of interest earned?

Today we will learn how to use the compound interest formula.
Compound Interest Formula

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

\( B \) = ending balance
\( p \) = principal or original balance
\( r \) = interest rate (converted)
\( n \) = number of compounds annually
\( t \) = number of years
Marie deposits $1,650 for three years at 1% interest, compounded daily. What is her ending balance?

Variables:

<table>
<thead>
<tr>
<th>B</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>1,650</td>
</tr>
<tr>
<td>r</td>
<td>0.01</td>
</tr>
<tr>
<td>n</td>
<td>365</td>
</tr>
<tr>
<td>t</td>
<td>3</td>
</tr>
</tbody>
</table>

Formula:

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

\[ B = 1650 \left(1 + \frac{0.01}{365}\right)^{(365)(3)} \]

\[ B = 1,700.25 \]

Her ending balance will be $1,700.25
Example 3A – **Now You Try It!**

Kate deposits $2,350 in an account that earns interest at a rate of 1.1%, compounded monthly. What is her **ending balance** after five years?

**Variables:**

- \( B = B \)
- \( p = 2,350 \)
- \( r = .011 \)
- \( n = 12 \)
- \( t = 5 \)

**Formula:**

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

\[
B = 2350 \left( 1 + \frac{.011}{12} \right)^{(12)(5)}
\]

\[B = $2,482.81\]

Her ending balance will be $$2,482.81
Marie deposits $1,650 for three years at 1% interest, compounded daily. How much interest does she earn?

Variables:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I$</td>
<td></td>
</tr>
<tr>
<td>$P$</td>
<td>$1,650$</td>
</tr>
<tr>
<td>$r$</td>
<td>$.01$</td>
</tr>
<tr>
<td>$n$</td>
<td>$365$</td>
</tr>
<tr>
<td>$t$</td>
<td>$3$</td>
</tr>
</tbody>
</table>

Formula:

$$I = P \left( 1 + \frac{r}{n} \right)^{nt} - P$$

$$I = 1650 \left( 1 + \frac{.01}{365} \right)^{(365)(3)} - 1650$$

$$I = $50.25$$

Her interest is $50.25$
Example 3B – Now You Try It!

Kate deposits $2,350 in an account that earns interest at a rate of 1.1%, compounded monthly. How much interest does she earn?

Variables: | Formula:
---|---
\( I = I \) | \( I = P \left( 1 + \frac{r}{n} \right)^{nt} - P \)
\( P = 2,350 \) | \( I = 2350 \left( 1 + \frac{0.011}{12} \right)^{(12)(5)} - 2350 \)
\( r = 0.011 \) | \( I = 2350 \left( 1 + \frac{0.011}{12} \right)^{(12)(5)} - 2350 \)
\( n = 12 \) | \( I = 2350 \left( 1 + \frac{0.011}{12} \right)^{(12)(5)} - 2350 \)
\( t = 5 \) | \( I = 2350 \left( 1 + \frac{0.011}{12} \right)^{(12)(5)} - 2350 \)

Her interest is $132.81
You want to earn the most interest income so how do you choose between:

- A simple interest account at 5%
- A daily compounding account 5.04%
- A monthly compounding account 5.05%

You need a way to compare them.

**Annual Percentage Yield (APY)**

It converts all the compounding rates to its equivalent simple interest rate so that you can compare “apples to apples”
Annual Percentage Yield APY

\[ APY = \left(1 + \frac{r}{n}\right)^n - 1 \]

*APY* = simple interest rate

*\( r \) = interest rate (converted)

*\( n \) = number of compounds annually
Sharon deposits $8,000 in a one year CD at 2% interest, compounded daily. What is Sharon’s annual percentage yield (APY) to the nearest hundredth of a percent?

Variables:

<table>
<thead>
<tr>
<th>APY = APY</th>
<th>Formula:</th>
</tr>
</thead>
<tbody>
<tr>
<td>r = .02</td>
<td>$APY = \left(1 + \frac{r}{n}\right)^n - 1$</td>
</tr>
<tr>
<td>n = 365</td>
<td>$APY = \left(1 + \frac{.02}{365}\right)^{365} - 1$</td>
</tr>
</tbody>
</table>

APY = 2.02%
Barbara deposits $3,000 in a one year CD at 1.1% interest, compounded daily. What is the APY to the nearest hundredth of a percent?

<table>
<thead>
<tr>
<th>Variables:</th>
<th>Formula:</th>
</tr>
</thead>
<tbody>
<tr>
<td>( APY = APY )</td>
<td>( APY = \left( 1 + \frac{r}{n} \right)^n - 1 )</td>
</tr>
<tr>
<td>( r = .011 )</td>
<td>( APY = \left( 1 + \frac{.011}{365} \right)^{365} - 1 )</td>
</tr>
<tr>
<td>( n = 365 )</td>
<td>( APY = 1.11% )</td>
</tr>
</tbody>
</table>
Please work on your assignment. It is due at the end of next class.

| Grade goes here | Read Pg: 95 to 99
Do Pg 100: #2-8, 10, 11, 14, 15, 16a-c | Last First
P__
A:2-5 |