

## Compound Interest II

### Chapter 5

\*\*\*\*\***READ THESE INSTRUCTIONS**\*\*\*\*\*

Banks pay interest on savings accounts on a periodic basis. When a bank pays interest, the amount is added to the customer's balance. During the next period, interest is earned on both the customer's original balance and the previous periods' interest. This concept is called **compound interest**.

#### Example:

Original customer deposit of \$1000, with interest of 5% compounded annually. At the end of year one, the interest paid will be  $(1000 * .05) = \$50$ . The customer's balance will then be  $(1000 + 50) = \$1050$ . At the end of year 2, the interest paid will be  $(1050 * .05) = \$52.50$ , and the customer's new balance will be  $(1050 + 52.50) = \$1102.50$ , and so on.

We previously wrote a program to calculate compound interest on an annual basis. However, interest is generally compounded more often than annually. Mathematically, compound interest can be calculated as follows:

### Compound Interest Formula

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

**P** = principal amount (the initial amount you deposit)

**r** = annual rate of interest (as a decimal)

**t** = number of years the amount is deposited for.

**A** = amount of money accumulated after n years, including interest.

**n** = number of times the interest is compounded per year

### Example:

An amount of \$1,500.00 is deposited in a bank paying an annual interest rate of 4.3%, compounded *quarterly*. What is the balance after 6 years?

### Solution:

Using the compound interest formula, we have that:

$P = 1500$ ,  $r = 4.3/100 = 0.043$ ,  $n = 4$ ,  $t = 6$ . Therefore,

$$A = 1500 \left(1 + \frac{0.043}{4}\right)^{4(6)} \approx \$1,938.84$$

So, the balance after 6 years is approximately \$1,938.84.

**Write a program that** prompts the user for their original deposit, how long (in years) they want to keep their money invested, and an ANNUAL rate of interest. Assume that interest is *compounded quarterly*. So, given the formula above, you know that  $n=4$ . Your program should output the amount accumulated per quarter. Output should be formatted as follows (using example numbers from above):

Quarterly Period	Accumulated Balance
1	1516.13
2	1532.42
3	1548.90
4	1565.54
5	And so on to ...
24	1938.84

Remember:  $x^y = \text{Math.pow}(x,y)$

