I am sure you have heard of the phenomenal “power of compounding.” Elders love to preach about the wisdom of starting a savings account at the age of 25 (when you don’t have any money left from your pay check after your not-so-sensible Vuitton/Gucci/Chanel escapades!) rather than at the age of 40 (when you have 2 mortgages, 2 kids and a high maintenance Cadillac). Let’s crunch some numbers to see if they are right.

Starting at age 25, if you put $200 every month for 40 years at 10% per annum, you will have more than 1.25 million at the age of 65.

Starting at age 40, if you put $200 every month for 25 years at 10% per annum, you will have only $265,000 at the age of 65.

You might have reservations about the fact that in the first case, you are investing more, after all! It’s not just about the longer time period. So look at it another way.

If you invest $25,000 at age 25 at 10% per annum, you will have $1.13 million at age 65.

But if you invest $25,000 at age 40 at 10% per annum, you will have $271,000 at age 65.

In the first case, you invest for less than double the time (for 40 years as compared to 25 years in the second case) but you get four times the return (1.31 million as compared to 271,000)… It seems that elders might have been right about this after all. (Now I wish I had listened to my dad!)

Since compounding has a powerful influence on finances, it is something you will come across often during your MBA studies. So GMAT likes to test you on it too. Let’s get crackin’ then.

As I mentioned in my previous post, compound Interest is an important application of successive percentage changes. GMAT tests you on simple and compound interest and sometimes, may even test you on the relation between the two. So let’s look at both of them one by one.

When you say that the rate of simple interest is 10% per annum, it means that you earn 10% on your original principal every year. Say I deposit $1000 for 4 years at 10% simple interest per annum. Amount at the end of one year is simply 1000*(11/10) = $1100 i.e. I earn $100 in a year. Since it is simple interest, every year I will earn the same amount i.e. $100. So total simple interest earned will be $100*4 = $400. If you observe carefully, we have calculated total simple interest using the following concept:

Simple Interest = Interest Rate/100 *Principal * No. of years

which is exactly what the formula for calculation of simple interest gives us.

Now let’s go on to compound interest. Compounding means successive percentage changes. It means that a sum of money increases by a certain percentage in a year. At the end of the year, the interest earned is combined with the principal and next year, interest is earned on this combined amount.

Say I deposit $1000 for 4 years at 10% compound interest per annum. Amount at the end of one year is simply 1000*(11/10) = $1100 i.e. I earn $100 in a year. Till now it is just like simple interest. But from next year on, we will earn on this extra $100 that we earned this year too. Amount at the end of 2nd year = 1100*(11/10) = 1210. Amount at the end of third year will be 1210*(11/10) and so on… As you can see, this is just 1000*(11/10)(11/10)(11/10)(11/10) or

A = P(1 + r)^i

(“i” is the number of time periods and r is the percentage rate of interest)

which is nothing but the ‘amount in case of compound interest’ formula

How does knowing this help us? GMAT tests your ingenuity and conceptual understanding. I will give below two examples where you will see how knowing this helps.

Example 1:

A bank launched a new financial instrument called VDeposit. A VDeposit offers you variable rate of compound interest in accordance with the current market rate. Ethan deposited $8000 in a VDeposit. If he gets interest rates of 10% in the first two years and 12.5% in the third year, what is the total amount at the end of 3 years?

As you can see, solving it using the standard formula is slightly cumbersome since we would have to use it twice. I would rather view it as:

8000*(11/10)(11/10)(9/8) = 1000*(11/10)*(11/10)*(9)

Notice that even though 12.5% compound interest was offered in the third year, we can still cancel off the 8 of 8000 with 8 of 12.5% increase when we view the calculation this way.

Amount = $10,890

Example 2:

Mark deposited $D in a scheme offering 5% simple interest per annum. Tetha deposited $D in a scheme offering 5% compound interest per annum. At the end of second year, Tetha had earned a total of $2.50 more than Mark. What is the value of D?

Till the end of first year, simple interest and compound interest cases are exactly the same. The difference comes in at the end of second year when compound interest offers interest on previous year's interest too. $2.50 is 5% interest earned in the second year on first year's interest.

2.5 = (5/100) * I

I = $50

So interest earned in the first year is $50, which is 5% of the deposited amount D

50 = (5/100)*D

D = $1000

In these and many more case, it pays to understand the concept of simple and compound interest.

Now, I will leave you with a question:

In the case of yearly compound interest, the ratio of amounts at the end of the 20th year to the amount at the end of the 22nd year is 0.81. What is the rate of interest?