Lesson 1: Simple Interest

Simple Interest – interest that is computed on the principal. The interest remains constant throughout the term.

Lender or creditor – person (or institution) who invests the money or makes the funds available.

Borrower or debtor – person (or institution) who owes the money or avails of the funds from the lender

Origin or loan date – date on which money is received by the borrower

Repayment date or maturity date – date on which the money borrowed or loan is to be completely repaid

Time or term (t) – amount of time in years the money is borrowed or invested; length of time between the origin and maturity dates

Principal (P) – amount of money borrowed or invested on the origin date

Rate(r) – annual rate, usually in percent, charged by the lender, or rate of increase of the investment

Interest (I) – amount paid or earned for the use of money

Maturity value or future value (F) –amount after t years that the lender receives from the borrower on the maturity date

A working student in one of the biggest fast-food restaurants in Lucena City wants to save for the upcoming school year. He wants to deposit his money into a Filipino owned bank so that even in a simple way he can help his fellow Filipino. Supposed his monthly salary is ₱10,000.00 and it was deposited to an account that earns a simple interest of 2.75% per annum. Find the simple interest after 6 months, one year, and 18 months.

$$Is = Prt$$

Where:
Is = Simple Interest
P = Principal or amount invested or borrowed
r = simple interest rate
t = term of time in years

Here are the steps to find the simple interest:

Step 1: Identify the given and the unknown
P = ₱10,000.00
r = 2.75% or 0.0275
t =0.5 or 6/12(6 months), 1 year, 1.5 or 18/12(18 months)

Step 2: Substitute the given to the formula
$$Is = Prt$$

For 6 months
Is = (₱ 10,000.00) (0275) (0.5)
    = ₱ 137.50

For 1 year
Is = (₱10,000.00) (0275) (1)
    = ₱ 270.00

For 18 months
Is = (₱10,000.00) (0275) (1.5)
    = ₱412.50

Notice that the time is divided into 12 since there are 12 months in a year. You will also do the same if the given is in days, the divisor will be 360 for ordinary interest or 365 if you are looking for exact interest. Don't worry because it will be indicated in the problem if you will compute for the ordinary or exact interests but if not indicated always use the ordinary interest which consists of 360 days. In case that the given time is in years then multiply it as is.

Lesson 2: Compound Interest

Compound interest is the interest computed on the principal and also on the accumulated past interest, so compound interest is a way to earn money because you don't just earn using your original money, but also the interest you earned. To give you a deeper concept of compound interest, reflect on the following questions: Have you ever lend money to someone like a friend, sibling, or relative? If so, would you let them pay more than, less than or just equal the amount that you lent to them? Since you consider to help them, probably you will answer just an equal amount is ok even though your money has been used for a period of time. But, I'm sure some will answer that you should receive more than the amount they borrowed and no one will say that you should receive less than the amount they borrowed.

I know you have your own reasons but let us see if compound interest will change your view in life regarding loans or borrowings, savings, and investment. Are you familiar with credit cards? We have what we call "Perma-Debt" which means a continuous outstanding balance of a credit card where they pay the monthly minimum that fits in their budget to lessen the burden of interest monthly but tries to add some debt again on the following month so the debts never end. So why did I tell you this? If you are a debtor, compound interest is not good for you. Better yet pay your debt in full the soonest possible so that the burden of interest will not be on your shoulder. Conversely, if you are an investor, compound interest is your best buddy and it is better to invest in a long period of time for you to have a greater return of your investment through interest earned. So, if you have the means or a way to save and invest early, you must consider it as soon as possible for you to gain more money in the future. Now, that you already know how to solve simple interest.

Study the example below and compare this to the example given in Lesson 1.
(Note: Same problem was given here to compare the interest earned in simple and compound interests)

Example Problem Solving:
Due to COVID-19 pandemic Miss Dada a female resident of Brgy. May Pagkakaisa somewhere in Quezon Province thinks of a business that can provide for her needs as well as the need of her neighbors so she can be of help even in this trying time.

Since she doesn't have money on hand, she decided to borrow from a bank with a start-up capital of ₱50,000.00 at 7% interest rate compounded annually and payable within 5 years.

Compute for the interest yield.

time	Amount at the start of the year t	Interest rate (r)	Compound interest (Solution)	Answer	Amount at the end of the year t(Maturity value)
1	50,000	7%	(50,000)(0.07)(1)	3,500.00	50,000 + 3,500 = 53,500
2	53,500	7%	(53,500)(0.07)(1)	3,745.00	53,500 + 3,745 = 57,245
3	57,245	7%	(57,245)(0.07)(1)	4,007.15	57,245 + 4,007.15 = 61,252.15
4	61,252.15	7%	(61,252.15)(0.07)(1)	4,827.65	61,252.15 + 4,827.65 = 66,079.80
5	66,079.80	7%	(66,079.80)(0.07)(1)	4,625.59	66,079.80 + 4,625.59 = 70,705.39

Compound interest includes the interest from the current year and added on the principal at the start of the following year, which means that the previous interest earns interest as well, together with the principal until fully paid. So the interest yielded on simple interest is lower than the compound interest. The amount at the end of 5 years in simple interest is ₱67,500.00 while in compound interest it is ₱70,705.39. Therefore, if you are a borrower make sure that the interest on your loan is not too high if you will find a lender that offers simple interest better grab it that a lender who offers compound interest. On the other hand, if you are an investor learn to invest your money to an interest that will yield higher returns like compound interest. If you will be a lender in the future, I hope that you will not be abusive regarding the interest, be reasonable, and act generously by helping others who needed you the most. Notice that the formula to find the future value in a compound interest is given by

$$F = P(1 + r)^t$$

Where:

      F = future value

      P = principal amount

      r = compound interest rate

      t = time or time in years

Also, to find the compound interest just deduct the principal (P) from the computed future value (F).

Lesson 3: Interest, Maturity, Future, and Present Values in Simple Interest

For you to begin consider the previous lesson essential in obtaining success in this module. In the last module, you differentiate simple and compound interest. Simple interest is computed by multiplying the principal (P) by the rate (r) and the length of time (t) (I=Prt) while compound interest is computed on the principal plus the accumulated past interests.

Different terms related to simple and compound interest were also given emphasis such as the lender or creditor which refers to the person who invests or makes funds available and the borrower or debtor, which refers to the person who owes the money.

Moreover, different terms essential in the interest formula were also explained such as time or term, principal or present value, rate, and maturity value. However, additional terms for compound interest were also given importance such as frequency of conversion, nominal rate, and rate of interest for each conversion period.

Other skills such as expressing percent to decimals is also necessary for example:

Express the following as decimal:

1. 12%   =   0.12

2. 10.5%   =   0.105

3. 300%   =   3

4. $8\frac{1}{2}$%   =   0.85

Read and analyze the situation below.

Let's Save

Janice and Jamaica are both senior high school students. After class the two had a conversation:

Janice: Wow, your cellphone is so cool! Is that new?

Jamaica: Thank you! And yes, I just bought it yesterday.

Janice: Did your mother give you money? What will you do with your old cellphone?

Jamaica: No, I saved up my allowance to accumulate enough money to buy this phone. I am still using my old phone. I will use my new phone for my social media accounts.

Janice: How much is that?

Jamaica: It is only ₱2,300 but it is already android so I can download different applications like Tiktok, Snapchat and games. Therefore, I will not be bored!

Janice: Oh! We are almost the same, I also saved ₱2,300 (already) from my allowance

Jamaica: What (do you plan) will you buy from your savings?

Janice: My old cellphone is still working, so I think there is no need for me to buy a new one. It will be better if I save this money.

Jamaica: But your money might get lost if you will not spend it?

Janice: I saw from an advertisement in Cooperative Bank that the minimum amount to open an account for students is ₱2,000, and they call it Kid Savers.

Jamaica: Is there an advantage if you put the money on the bank?

Janice: According to the advertisement there will be 2.5% interest in a year. I will use it in my college education.

From the previous conversation, you can say that allowance is one of the sources of funds of ordinary students. A person may decide on what they want to do with their money. In the scenario, there are two kinds of students. One who saves to buy the things they wanted and the other one saves to invest for her future. In doing so investing money in the bank earns interest. In computing the simple interest and other related components, the formula is

$$Is = Prt$$

Where:
    Is = simple interest
    P = principal or the amount invested or borrowed or present value
    r = simple interest rate
    t = time or term in years

The formula can be manipulated to obtain the following relationships:
The formula for finding the principal amount

$$P = Is/rt$$

The formula for finding the rate

$$r = Is/Pt$$

The formula for finding the time

$$t = Is/Pr$$

To find the maturity (future) value, you can use either of the following:

$$F = P(1 + r)^t \qquad \text{or} \qquad F = P + Is$$

Where:
    F = maturity (future) value
    Is = simple interest
    P = principal or the amount invested or borrowed or present value
    r = simple interest rate
    t = time or term in years

Lesson 4: Interest, Maturity, Future, and Present Values in Compound Interest

For you to begin considering the lesson on the previous module which is essential in obtaining success in this lesson. Compound interest is not like a simple interest wherein only the principal is considered in the computation this type of interest considers the principal and the accumulated past interest. The frequency of conversion, nominal rate, and rate of interest for each conversion period will also play an important role in this lesson.

In the previous lesson the maturity value is computed using the formula F = Is + P where F is the future value, Is is the simple interest and P the present value or the Principal and to find the principal or present value given the interest and maturity value the formula P = F – Is can be employed.

Let us take the following example.

Example 1: Given: P = ₱35,000 and Is = ₱ 4,000, find F.
Solution: F
F = ₱35,000 + ₱4,000 = ₱39,000

Example 2: Given: F = ₱50,000 and P = ₱45,000, find Is.
Solution:
Is = ₱50,000 – ₱45,000= ₱5,000

Example 3: Given Is = ₱2,000 and F = ₱23,000., find P.
Solution:
P = ₱23,000 - ₱2,000 b = ₱21,000

Read and analyze the situation below.

Let's Save

Michael is planning to apply for a loan in a Cooperative Bank, and he is already aware of the terms and conditions of payment for his loan. When he is about to pass his application form and compare his computation with the bank's payment terms he notices some discrepancies.

Michael's Computation
Amount of Loan: ₱100,000
Interest rate: 3%
Due Date: After 3 years
Computation:
I = (100,000)(0.03(3)
I = ₱9,000
Amount to be paid after 3 years
₱109,000

To be enlightened, he asked some explanations why they have different computations and the bank gave him the detailed computation:
Initially at t = 0 ₱100,000
at t = 1 ₱100,000 (1.03) = ₱103,000
at t = 2 ₱103,000 (1.03) = ₱106,090
at t = 3 ₱106,090 (1.03) = ₱109,272.70

Notice that there is a difference between the computation of Michael and the bank concerning the amount to be paid for the loan. Michael used simple interest to find the amount to be paid for the loan for three years. While the bank computed first the interest for the first year and added it to the loan amount, then the resulting amount becomes the basis for computing the total amount to be paid for the second year, and it follows the same pattern for the third year. Interest plays a major role in computation because it became one of the factors in determining the amount to be paid for the succeeding years. In such a case, we call that compound interest. To better understand of what compound interest is, the following formulas will be considered.

To find the compound interest, which is compounded annually the formula to find the maturity value is:

$$F = P(1 + r)^t$$

Where:

F = maturity (future) value
P = principal or present value
r = interest rate
t = term or time in years

To find the compound interest use the formula:
$$Ic = F - P$$
Where:

Ic = compound interest
P = principal or present value
F = maturity (future) value

To find the present value or principal of the maturity value F due in t years the formulas are:

$$P = F/ (1 + r)^t \text{ or } P = F(1 +)^{-t}$$

Example 1: Given: P= ₱18,500, r = 3% and compounded annually for 3 years, find the maturity value (F) and the compound interest (Ic).

Solution:

Use the formula of maturity value	$F = P(1 + r)^t$
Substitute the given to the formula	$F = 18,500(1 + 0.03)^3$
Performing the operations	$F = ₱20,215.45$
Apply the formula of compound interest	$Ic = F - P$
Substitute the value of F that you get and P	$Ic = 20,215.45 - 18500$
Performing the operations	$Ic = ₱1,715.45$

Therefore, the maturity value is ₱20,215.45 and the compound interest is ₱1,715.45

Compounding More Than Once a Year

In the example above the interest are compounded annually, however, there are cases that interest are compounded more than once a year so in this case additional terms must be clarified such as:

Frequency of conversion (m) - number of conversion period in one year
Conversion or interest period – time between successive conversions of interest
Total number of conversion periods (n)
n = mt = (frequency of conversion) x (time in years)
Nominal rate (i^m) - annual rate of interest or interest rate per year
Rate (j) of interest for each conversion period
j = i^m/m = annual rate of interest/frequency of conversion