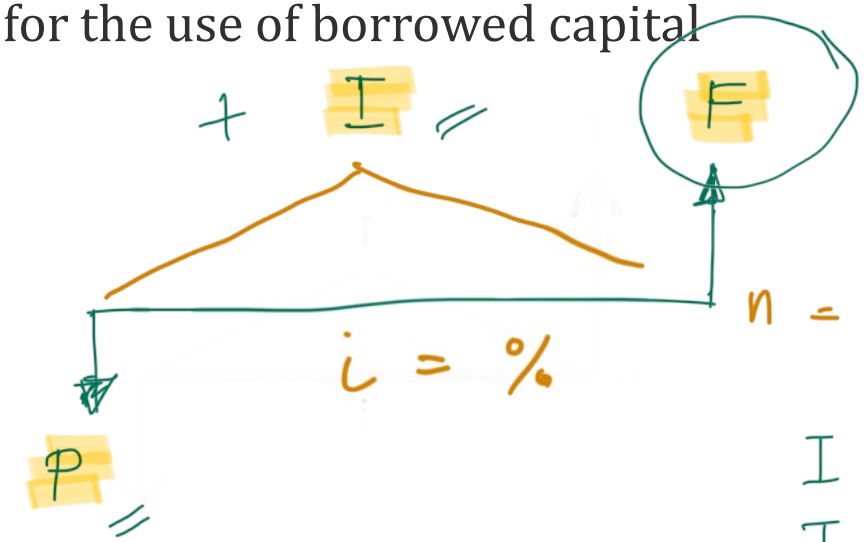
Lesson 2

ESS5
Engineering Economy

INTEREST (I)

- the amount earned by an investment
- The amount paid for the use of borrowed capital



- F = P + I

Where:

P = Principal worth or Present worth
F = Future worth
I = amount of interest gained
n = number of years
i = simple interest rate in a year

₱ money

$I \propto P$
$I \propto i$
$I \propto n$
$I = P \times i \times n$
$I = Pin$

$F = P + I$
$F = P + (Pin)$
$F = P(1 + in)$
$P = F(1 + in)^{-1}$
$= \frac{F}{(1 + in)}$

Two types of INTEREST

I. **Simple Interest** – the type of interest that follows the principle ***"only the principal earns interest"***

Kinds of Simple Interest:

a. Ordinary Simple Interest – the type of simple interest which is computed based on one banker year.

1 year = 360 days 1 month = 30 days (February has 30 days)

1 year = 12 months

b. Exact Simple Interest – computed based on the actual or exact number of days in one year as follows:

1. Ordinary Year – any year not visible by 4

1 year = 365 days (February has 28 days)

ex: 1967, 1936, 2009

2. Leap Year – any year visible by 4 except Century Years

ex: 1980, 1992, 2004, 2008

3. Century Year – years ending in 00

ex: 1800, 1900, 2000

1 year = 366 days (February has 29 days)

Note:

- If the kind of simple interest is not mentioned, assume it is Ordinary Simple Interest → 1 yr = 360 days, 12 mos (Feb = 30 days)

- If under Exact Simple Interest:

January, March, May, July, August, October, December	31 Days
April, June, September, November	30 Days
February	28 or 29 Days

Sample Problems:

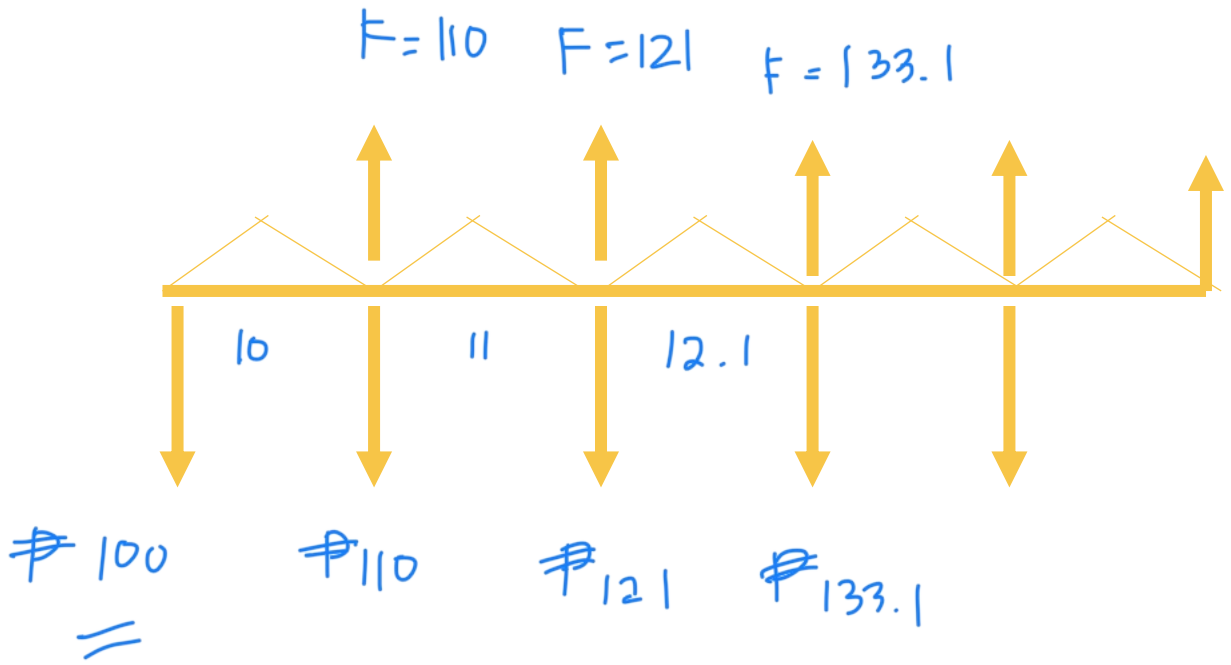
1) Compute for the future worth and the interest earned by ₱10,000 invested at 10% interest rate for 3 years?

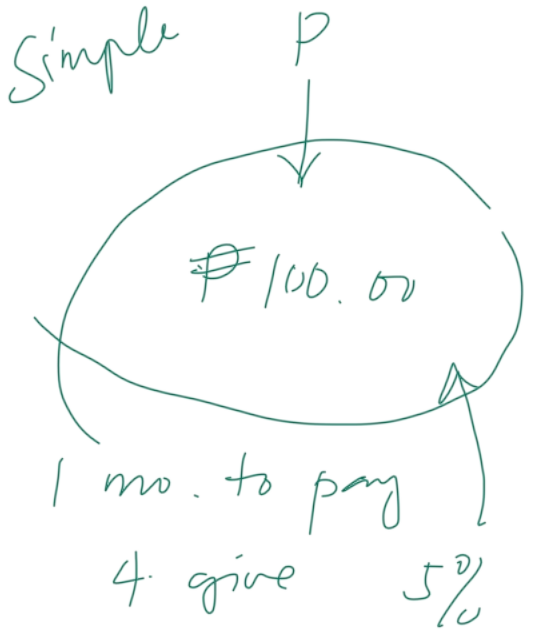
2) How many days will it take money to double itself at 2% simple interest?

3) What amount shall be deposited on January 15, 2001 to accumulate to 1Million pesos on December 8 of the same year if money worth 13.5% of exact simple interest?

4) At what simple interest should ₱1,000 be invested during the first year so that after 2 years, its accumulated amount will be ₱1,250? Simple interest rate during the second year is 10%.

II. **Compound Interest** – It is the type of interest that follows the principle ***"interest on top of an interest".*** Both principal & interest earned interest.





1st .5
2nd .5

3rd .5

4th .5

120

Where:

P = Present Worth or Principle

F = Future Worth or Accumulated Amount

I = Amount of interest gained

✓ i = Interest rate ; $i = \frac{i_n}{m}$

✓ i_n = Nominal rate of interest, the interest rate where conversion is allowed (compounded)

✓ m = number of compounding period in one year, number of payments in one year

n = number of years

✓ N = total number of periods

$N = mn$

	m
daily	365
weekly	52
monthly	12
bi-monthly	6
semi-annually	2

Sample conversion:

$$i = \frac{in}{m}$$

$$N = mn$$

quarterly	4
annually	1

1) 20% compounded quarterly

$in = 20\%$ or 0.2

$m = 4$

$$i = \frac{0.20}{4} = 0.05$$

$i = 5\%$

2) 24% compounded bi-monthly ; $i = 12\%$

3.) ~~36~~ 36% compounded semi-annually

$i = 18\%$

Sample Problems: (Compounded)

1) What will be the accumulated amount of ₱6,000 after 3 years if money worth is 16% compounded quarterly?
2) How many whole year will it take money to triple itself if invested at 20% compounded daily?
3) What will be the accumulated amount of ₱1,000 after 2 years and 7 months at 18% compounded monthly using simple interest for any time less than a year interest period at 15%? How much it gained?