

# Lesson 2.1

## Percentage Increases and Decreases

## *Note:*

- ▶ Often prices are increased or decreased by a percentage. In this section we consider how to increase or decrease quantities by using percentage.

## *Formula:*

▶ Percentage Increase

$(P_i)$ :

$$P_i = B + P$$

▶ Percentage Decrease

$(P_d)$ :

$$P_d = B - P$$

## *Example 2.1.1:*

- ▶ Ms. Pam Pamintuan earns P1,000.00 per week for her part-time job. She is to be given a 5% pay rise. How much will she earn per week after the pay?

## *Example 2.1.2:*

- ▶ The prices of all the television televisions in a shop are to be increased by 8%. Calculate the new price of a television that originally cost P10,500.00.

### *Example 2.1.3:*

► In a sale the cost of a computer is reduced by 30%. The normal price of the computer was P15,650.00. Calculate the sale price of the computer.

# *Lesson 2.2*

## The Concept of Simple Interest

## *Interest or Simple Interest*

- ▶ This refers to the amount (or price) paid for the use of money. We will use ***I*** (majuscule letter I) to denote the *Interest*.



# *Categories of Interest*

- 1. Simple Interest;*
- 2. Simple Discount; and*
- 3. Compound Interest.*

Something to think about...

- ▶ What do you think are the reasons why people borrow money?

# *Lender vs. Lendee*

- ▶ The *lender* refers to a person or an entity that lends money. On the other hand, the person or the entity who borrows money is referred to as the *lendee*.

# Something to think about...

- ▶ The lower the interest rate the more people are over-optimistic to borrow money.

# Something to think about...

- ▶ The higher the interest rate the lesser people are optimistic to borrow money.

Something to think about...

▶ How high interest  
hurts seasonal  
businesses?

Something to think about...

▶ How government  
benefits from  
interest?

# Something to think about...

- ▶ How businesses/foreign investors benefit from interest?



## *Three Factors where Interest (I) depends:*

1. The Principal (P)
2. The Rate of Interest (r)
3. The Time (t)

# The Principal ( $P$ )

- ▶ This refers to the sum of money invested, deposited or borrowed. We will use  $P$  (majuscule letter P) to denote or represent the *Principal*.

# The Rate of Interest ( $r$ )

- ▶ This refers to the percentage of the principal per year and is generally expressed in terms of percent.
- ▶ The *rate of interest* is usually represented by  $r$  (minuscule letter  $r$ ).

# *Reminder:*

- ▶ Before computing rate in percent must be expressed in decimal form.

# The Time ( $t$ )

- ▶ This refers to the length of time between the date the loan is made and the date the loan becomes payable to the lender. To denote *time* we will use  $t$  (minuscule letter t).

# *The Amount of Interest Formula*

$$I = Prt$$

*(Equation 2.1)*

# *Equation 2.1*

- ▶ This shall be used in computing for the amount of interest  $I$  given the principal  $P$ , the rate  $r$ , and the time  $t$ .

## *Reminder:*

- ▶ In simple interest, the amount of interest earned per annum is constant.



## *Example 2.1:*

Nimfa Bebe deposited P5,000.00 in a bank paying 6% simple interest for 5 years. Compute the:

(a) amount of interest per annum;  
and

(b) total amount of interest for the entire period.

How about if rate  $r$  is unknown?

$$r = \frac{I}{Pt}$$

*(Equation 2.2)*

# Equation 2.2

- ▶ This shall be used in computing for the rate of interest  $r$  given the amount of interest  $I$ , the principal  $P$  and the time  $t$ .

## *Example 2.3:*

- ▶ The simple interest received over a period of 5 years and 3 months on a loan of P22,000.00 is P11,300.00. Compute the rate of interest.

How about when time  $t$  is unknown?

$$t = \frac{I}{Pr}$$

*(Equation 2.3)*

# Equation 2.3

- ▶ This shall be used in computing the *time*  $t$  given the principal  $P$ , rate  $r$  and the amount of interest  $I$ .

## *Example 2.5:*

- ▶ Lady Supladita borrowed P5,000.00 from a bank charging 12% simple interest. If she paid the amount of interest equivalent to P1,200.00, for how long did she use the money?

How about when Principal  $P$  is unknown?

$$P = \frac{I}{rt}$$

*(Equation 2.4)*



## *Equation 2.4*

- ▶ This shall be used in computing the Principal  $P$  when amount of interest  $I$ , rate of interest  $r$  and time  $t$  are given.

## *Example 2.7:*

- ▶ Boss Mapagmahal08 paid an interest of P2,800.00 on a loan for 2 years at 9.5%. How much was the original loan?

## Let's Practice: Solve the following problems.

1. Compute for the amount of simple interest on the following loans:
  - a. P180,000.00 at 8% for 3 years
  - b. P106,200.00 at 8 ½% for 2 years
2. If money is worth 8.5%, then how much shall be the principal if it will earn an interest of P5,500.00 in 3 years and 6 months?
3. Ms. Taylor Swift borrowed P15, 820.00 at 6% simple interest. She was charged an interest of P1,260.00. Compute for the duration of the loan on years.

## Assignment: Solve the following problems.

1. Mr. Harry Styles borrowed P25,300.00 for 3 years at 8% simple interest. How much was the amount charged for the use of money?
2. For how long (in years) will an amount of P25,000.00 be invested at 10.75% to earn an interest of P8,200.00?
3. At what interest rate will an investment of P50,000.00 earn an interest of P10,062.50 in 1 year and 9 months?
4. Mr. Nick Jonas invested an amount of P18,360.00 at 9.75%. How much shall be his interest earnings after 3 years and 2 months?

# *Lesson 2.2*

The Accumulated Value  
and the Present Value

# *Accumulated Value*

- ▶ This refers to the sum of money at the end of the period when a certain amount of money is deposited or borrowed.

# *Accumulated Value*

- ▶ Accumulated Value is also called the *future value*. To denote accumulated value we will use **AV** (majuscule letters A and V).

How to compute for AV?

$$AV = P + I$$

*or*  $AV = P(1 + rt)$

*(Equation 2.5 and 2.6)*



# *Equation 2.5 and 2.6*

- ▶ This shall be used in computing the Accumulated Value  $AV$  given the amount of Principal  $P$  and the amount of Interest  $I$ .

## *Example 2.9:*

Mr. Hagardo Versosa paid an interest of P5,000.00 on a loan for 3 years at 8% simple interest. Compute the value of:

- (a) the original loan; and
- (b) the amount he paid at the end of 3 years.

*Something to think about...*

▶ *Therefore, based on example 2.9 what is now the Present Value?*

# *Present Value (PV)*

- ▶ The present value is the current worth of a future sum of invested, borrowed, or deposited money given a specified rate of return.

We will denote this using **PV**  
(majuscule letters P and V).

How to compute for PV?

$$PV = \frac{AV}{1 + rt}$$

*(Equation 2.7)*

# Equation 2.7

- ▶ This shall be used in computing for present value  $PV$  given the accumulated value  $AV$ , rate  $r$ , and time  $t$ .

## *Example 2.11*

The accumulated value paid by Mr. Ely Pante on a loan is P72,000.00. If the loan was for 3 years at 9% simple interest, (a) how much was the original loan? (b) Compute the total amount of interest.

Therefore, for computing total amount of interest ( $TI$ )...

$$TI = AV - PV$$

*(Equation 2.8)*



## Equation 2.8

- ▶ This shall be used in computing for the total amount of interest  $TI$  given the accumulated value  $AV$  and the present value  $PV$ .

Let's Practice: Determine the missing items in each of the following:

Principal	Rate	Time	Interest	Accumulated Amount
P12,000.00	3.5%	3.5 years		
	6.0%	9 months	P650.00	

Miss Mary Christmas Aguinaldo deposited an amount of P32,600.00 in a bank that gives 4.5% on savings account. How much shall be the accumulated value of the investment after 3 years and 7 months? How much shall be the interest earnings?

# *Lesson 2.3*

## Exact and Ordinary Interests

# *Something to think about...*

When the term of investment is expressed in days, what would be the approach in computing for the amount of interest?

# *Two Approaches*

1. Exact Interest

2. Ordinary  
Interest

# *Exact Interest*

▶ This is used when interest is computed on the basis of 365 days a year or 366 days in a leap year. To denote Exact Interest

we will use the symbol  $I_e$  (majuscule letter  $I$  and subscript minuscule letter  $e$ ).

Therefore, for Exact Interest:

$$I_e = \frac{Prt}{365}$$

*(Equation 2.9)*

## *Equation 2.9*

This shall be used when computing for the Exact Interest, given the Principal amount, the rate of interest and the time per days.



# *Ordinary Interest*

- ▶ This is used when interest is computed on the basis of an assumed 30-day/month or 360-day/year. We shall use  $I_o$  (majuscule letter  $I$  and subscript minuscule letter  $o$ ).

*While for, Ordinary Interest:*

$$I_o = \frac{Prt}{360}$$

*(Equation 2.10)*

## *Equation 2.10*

This shall be used when computing for the Ordinary Interest, given the Principal amount, the rate of interest and the time per days.

## *Example 2.12*

Mr. Benny Bilang invested an amount of P28,100.00 at 7% simple interest for 100days.

Compute the value of the:

(a) exact interest; and

(b) ordinary interest.

# *Example 2.13*

Ms. Honeygirl Pulot-Pukyutan deposited an amount of P12,800.00 in a time deposit account at 8% simple interest for 150 days. Compute the value of the:

- (a) exact interest; and
- (b) the accumulated value at the end of the term.

# *Let's Practice: Solve the following.*

1. An amount of P15,600.00 was invested at 8% simple interest for 115 days. Compute the amount of interest and the accumulated value using: (a) exact interest and (b) ordinary interest.
2. Using exact interest of 8% simple interest, determine the present value of an investment that accumulated to P21,700.00 after 285 days.

# Lesson 2.3

## *Simple Discount*

# *Recall...*

- ▶ How do we compute for the amount of simple interest?



# *Recall...*

- ▶ In simple interest, when do we pay for the amount of interest?

# *Simple Discount*

▶ This refers to the type of interest where the amount of interest is deducted in advance and is computed based on the maturity/accumulated/future value.

*Something to think about...*

▶ In business, what do you know about discount?

# *In business...*

- ▶ a deduction from the usual cost of something,
  - ▶ reductions to the basic prices of goods or services

# *The Concept of Simple Discount*

▶ Here, the term discount refers to the amount deducted from the maturity value/amount due of an obligation.

*Thus,*

▶ the price of using money is deducted in advance.

# Reflect...

▶ In simple discount, the borrower pays the original sum of money borrowed at the end of the term at a specified discount rate.

# Therefore...

- ▶ The amount due ( $AV$ ) at the end of the term ( $t$ ) is charged an interest in advance at simple interest rate ( $d$ ).



# *In Simple Discount...*

▶ Here, in simple discount, we will call the amount of interest as the amount of discount.

# *Amount of Discount...*

$$I = AVdt$$

*(Equation 2.15)*

# *Equation 2.15*

- ▶ This equation shall be used when computing for the amount of discount ( $I$ ) given the amount due ( $AV$ ), discount rate ( $r$ ) and the term of the loan ( $t$ ).

# *Amount Due*

$$AV = \frac{I}{dt}$$

*(Equation 2.16)*

# *Equation 2.16*

- ▶ This equation shall be used when computing for the amount due ( $AV$ ) given the amount of discount ( $I$ ), discount rate ( $d$ ) and the term of the loan ( $t$ ).

# *Discount Rate*

$$d = \frac{I}{AVt}$$

*(Equation 2.17)*

# *Equation 2.17*

- ▶ This equation shall be used when computing for the discount rate ( $d$ ) given the amount of discount ( $I$ ), the amount of the loan ( $AV$ ) and the term of the loan ( $t$ ).

# *Term of the Loan*

$$t = \frac{I}{AVd}$$

*(Equation 2.18)*



# *Equation 2.17*

- ▶ This equation shall be used when computing for the term of the loan ( $t$ ) given the amount of discount ( $I$ ), the amount due ( $AV$ ) and the discount rate ( $d$ ).

## *Example 2.16*

- ▶ How much interest will be collected in advance from a loan of P15,000.00 made by Ms. Victoria Malihim for 2 years if the discount rate is 8%?

## *Example 2.17*

- ▶ On June 11, 2007, Dayuhin Mo Ako Resort borrowed P6,000.00 from a credit union and was charged P410.00 for the loan. If interest was deducted in advance, what was the discount rate? Assume that the loan shall be paid on December 20 of the same year.

## *Example 2.18*

► Ms. Lily Mangipin borrowed a certain amount from a cooperative and was charged P2,000.00 deducted in advance. If the discount rate is 12% for 6 months, how much is the amount of the loan?

# *Reflect...*

If in simple interest, the amount of interest is deducted in advance, what do we call to the money received by the borrower when he loans?

# *Recall...*

- ▶ From our previous lesson, how do we compute for the accumulated value (AV)?

# Accumulated Value

$$AV = P + I$$

# Proceeds (Pr)

- ▶ It is the amount received by the borrower at the beginning of the term.



# Moreover...

- ▶ The value of proceeds is equivalent to the concept of principal/original loan/present value.

# However...

▶ For purposes of clarity, we shall use  $P_r$  to indicate the present value at simple discount.

# *Remember...*

- ▶ The phrase, “to discount” means to get the value of the proceeds.

# Proceeds

$$Pr = S(I - dt)$$

*(Equation 2.18)*

# *Equation 2.18*

► This equation shall be used when computing for the amount received by the borrower at the beginning of the term ( $Pr$ ), given the amount due ( $AV$ ), discount rate ( $r$ ), and term of the loan ( $t$ ).

# *Example 2.19*

- ▶ Determine the proceeds of P18,500.00 for 2 years and 6 months at 10% simple discount.

# *Example 2.20*

- ▶ Find the proceeds and the amount of discount on P8,000.00 due at the end of 2 years at 8% simple discount.

# *Let's Practice: Solve the following problems.*

1. Determine what is missing value in each of the following:

Amount Due (AV)	Discount Rate (d)	Term of the Loan (t)	Amount of Discount (I)	Proceeds (Pr)
P8,560.00	7.5%	125 days		
	8.25%	100 days		P28,250.00

2. Ms. Pining Garcia borrowed P55,000.00 from a bank that charges 12% simple discount. If Ms. Pining agreed to pay her accounts 5 months from today, what sum of money will she receive from the bank?