

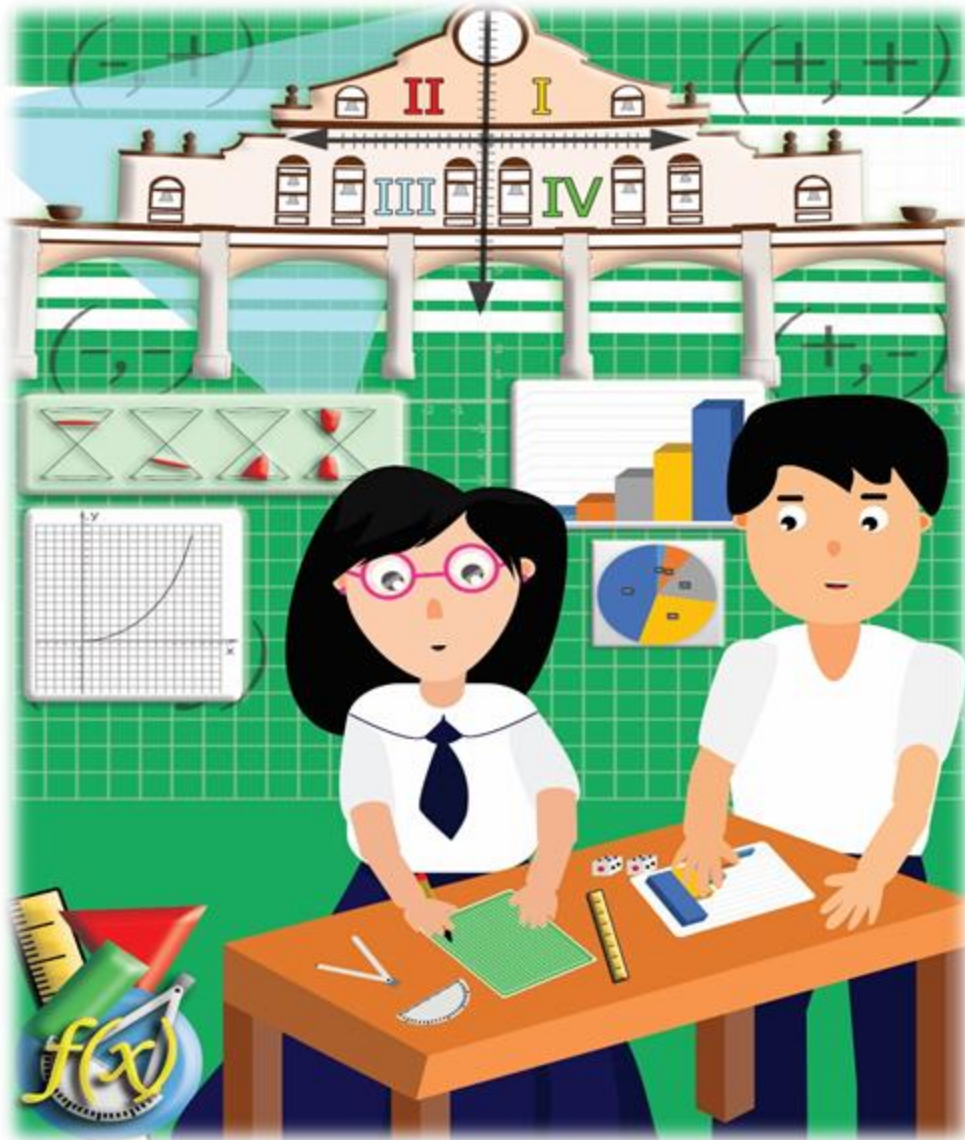
Senior High School

Department of Education
National Capital Region

**SCHOOLS DIVISION OFFICE
MARIKINA CITY**

GENERAL MATHEMATICS

Quarter 2: Module 5 Basic Concepts of Loans



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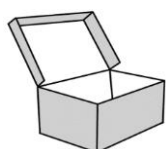
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What I Need to Know

Hello senior high school learners! In this module, you will learn how to:

Represent basic concepts of loans: illustrates business and consumer loans, and distinguish between business and consumer loans **M11-GM-IIf-1, M11-GM-IIf-2; and**

Solve problems involving business and consumer loans (amortization, mortgage) **M11-GM-IIf-3.**

You can say that you have understood the lesson in this module if you can already:

1. Represent a basic concepts of loans: illustrates business and consumer loans, and distinguish between business and consumer loans and
2. Solve problems involving business and consumer loans (amortization, mortgage).



What I Know

Choose the correct answer.

For item 1- 5, refer to the choices inside the box that illustrates the situation below.

A. Consumer Loan	B. Business Loan	C. Mortgage	D. Collateral
------------------	------------------	-------------	---------------

1. Mr. Agustin plans to open a barbershop. He wants to borrow some money from the bank for him to buy the equipment and furniture for the barbershop.

2. Mr. and Mrs. Craig want to borrow money from the bank to finance the college education of their son.

3. Mr. Alonso wants to have some improvements on their 10-year old house. He wants to build a new room for their 13-year old daughter. He will borrow some money from the bank to finance this plan.



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4. Mr. Samson owns a *siomai* food cart business. He wants to put another food cart on a new mall in the other city. He decided to have a loan to establish the new business.

5. Roan has a computer shop. She owns 6 computers. She decided to borrow some money from the bank to buy 10 more computers.

6. A loan, secured by a collateral, that the borrower is obliged to pay at specified terms.

- | | |
|------------------|------------------|
| A. Collateral | B. Mortgage |
| C. Business loan | D. Consumer loan |

7. Mr. Garcia borrowed ₱1,000,000.00 for the expansion of his business. The effective rate of interest is 7%. The loan is to be repaid in full after one year. How much is to be paid after one year?

- | | |
|------------------|------------------|
| A. ₱1,070,000.00 | B. ₱1,080,000.00 |
| C. ₱1,050,000.00 | D. ₱1,060,000.00 |

8. A person borrowed ₱1,200,000.00 for the purchase of a car. If his monthly payment is ₱31,000.00 on a 5-year mortgage, find the total amount of interest.

- | | |
|------------------|------------------|
| A. ₱2,100,000.00 | B. ₱2,200,000.00 |
| C. ₱2,300,000.00 | D. ₱2,400,000.00 |

9. If a house is sold for ₱3,000,000 and the bank requires 20% down payment, find the amount of the mortgage.

- | | |
|------------------|------------------|
| A. ₱2,100,000.00 | B. ₱2,200,000.00 |
| C. ₱2,300,000.00 | D. ₱2,400,000.00 |

10. Ms. Ronal bought a car. After paying the down payment, the amount of the loan is ₱400,000.00 with an interest rate of 9% compounded monthly. The term of the loan is 3 years. How much is the monthly payment?

- | | |
|---------------|---------------|
| A. ₱12,719.89 | B. ₱11,719.89 |
| C. ₱10,719.89 | D. ₱9,719.89 |



LESSON 1: Business and Consumer Loans



What's In

Answer these questions.

1. What is the difference between stocks and bonds?
2. What situations show stocks and bonds? Write two.



What's New

Think about this!

How many of your siblings had finished college? Are you aware that some of your parents borrowed money from banks to sustain your siblings' college education?

The presented situation is one of the examples of our next discussion. Our lesson will focus on the different types of loans.



What is It

Definition of Terms

Business Loan- money lent specially for a business purpose. It may be used to start a business or to have a business expansion.

Consumer Loan- money lent to an individual for personal or family purpose.

Collateral- assets used to secure the loan. It may be real estate or other investments.

Term of the Loan- time to pay the entire loan.

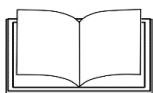
Consumer loans are loans given to individuals for personal or family purpose while business loans are loans for businesses. **Consumer loans** and **business loans** may require a collateral. The collateral for both loans may be real estate or other investments. For business loans, they can use equipment, fixtures or furniture as collateral. Consumer loans do not usually require a guarantor. Business loans require the business owners to sign as guarantor. For consumer loans, the bank or the lending institution may require a credit report, bank statements, and an income tax return, and if the lendee is employed, a certificate of employment and employees pay



slips. For business loans, the lendee has to submit a credit report, income tax returns and company financial statement. The term of the business loan is generally shorter than the consumer loan. The interest rate for the business loan is usually higher than for the consumer loan.

Here are some situations that illustrates consumer and business loans.

1. Mr. Apostol plans to have a computer shop. He wants to borrow some money from the bank for him to buy the equipment and furniture for the computer shop. (Business loan)
2. Mr. and Mrs. Santos want to borrow money from the bank to finance the college education of their daughter. (Consumer loan)
3. Mr. Pascual wants to have some improvements on their 10-year old house. He wants to build a new room for their 13-year old daughter. He will borrow some money from the bank to finance this plan. (Consumer loan)
4. Mr. Santiago owns a burger food cart business. He wants to put another food cart on a new mall in the other city. He decided to have a loan to establish the new business. (Business loan)



What's More

Identify the following whether it is a business or a consumer loan.

1. Mr. Villegas wants to open another branch of his cellphone repair shop. He decided to apply for a loan that he can use to pay for the rentals of the new branch.
2. Michael runs a trucking business. He wants to buy 4 more trucks for the expansion of his business. He applied for a loan in a bank.
3. Mr. Bautista decided to take his family for a vacation. To cover the expenses, he decided to apply for a loan.
4. Ben decided to purchase a condominium unit near his workplace. He got a loan worth ₱3,000,000.00.
5. Mrs. Bernal wants to renovate her house amounting to ₱90,000.00. This was made possible because of an approved loan worth ₱80,000.00.



What I Have Learned

Write the term/expression that will complete the statements.

1. _____ money lent specifically for a business purpose. It may be used to start a business or to have a business expansion.
2. _____ money lent to an individual for personal or family purpose



3. _____ time to pay the entire loan
4. _____ assets used to secure the loan. It may be real-estate or other investments.



What I Can Do

Give and describe two TV commercials showing business/consumer loans.

Rubrics

Score	Description
15 points	90-100% correct answers with concrete explanation; output is neat and organized.
10 points	60-89% correct answers with an explanation; output is neat and organized.
5 points	Incomplete answer with 50% incorrect answers; output is neat and organized.
No point earned	No output submitted.



Assessment

Identify whether the following is a consumer or business loan.

1. Mrs. Cortez plans to have a parlor. She wants to borrow some money from the bank for her to buy some materials for the parlor.
2. Mr. and Mrs. Valencia want to borrow money from the bank to finance the college education of their son.
3. Melody has restaurants. She owns 2 restaurants. She decided to borrow some money from the bank to have 4 more restaurants.
4. Mr. Alonzo wants to have another branch of computer repair shop. He decided to apply for a loan that he can use to pay for the rentals of the new branch.
5. Mrs. Dela Cruz decided to take her family for a vacation. To cover the expenses, she decided to apply for a loan.



Additional Activities

Complete the table.

Characteristics	Business Loans	Consumer Loans
Similarities		
Ownership		
Interest Rate		
Trading		
Examples (3)		



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LESSON 2: Solving Problems Involving Business and Consumer Loans (Amortization and Mortgage)



What's In

Match the terms in Column B to its correct definitions under Column A.

Column A

1. The process of paying a loan and its interest through series of regular equal payments.
2. It is lent to business companies to find their business operating costs.
3. An individual who agrees to pay back a loan if the borrower fails to pay the loan on time
4. It is an asset presented by a borrower that is pledge to be given to the lender in case the borrower defaulted the loan or failed to pay back the loan.
5. It is a money lent to an individual for personal or family purpose

Column B

- A. Mortgage
- B. Amortization
- C. Collateral
- D. Guarantor
- E. Consumer loan

Analyze the situations below.

1. Mr. Apollo decided to buy a house and lot for his family. The loan amounts to ₱2,500,000. He amortized the loan by paying ₱23,000.00 monthly for 20 years.
2. Ms. Salceda bought a car for ₱800,000.00. After deducting the down payment, her total loan amounts to ₱750,000.00. She amortized the loan by paying ₱18,000.00 monthly for 5 years.
3. Mr. Francisco applied for a salary loan from his social security insurance. He got a ₱20,000.00 loan. To pay this loan, he has to pay ₱1,100.00 monthly for 2 years.

Car loan, housing loan, SSS and GSIS salary loan, and credit card cash loan are real life situations where we can apply business and consumer loans. Once you get a loan, you should fulfill your obligation by paying regularly.



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What is It

Definition of Terms

Amortization Method- method of paying a loan principal and interest on installment basis, usually of equal amounts at regular intervals

Mortgage – a loan, secured by a collateral, that the borrower is obliged to pay at specified terms

Chattel Mortgage – a mortgage on a movable property

Collateral – assets used to secure the loan. It may be a real-estate or other investments.

Outstanding Balance – any remaining debt at a specified time

Basics of a Mortgage Loan

A **mortgage** is a business loan or a consumer loan that is secured with a collateral. **Collaterals** are assets that can secure a loan. If a borrower cannot pay the loan, the lender has a right to the collateral. The most common collaterals are real estate property. For business loans, equipment, furniture and vehicles may also be used as collaterals. Usually, the loan is secured by the property bought. For example, if a house and lot is purchased, the purchased house and lot will be used as a mortgaged property or a collateral. During the term of the loan, the **mortgagor** or the lender in a mortgage, still has the right to possess and use the mortgaged property. In the event the mortgagor does not make regular payments on the mortgage, the **mortgagee** or the lender in a mortgage can repossess the mortgaged property. The most common type of mortgage is the **fixed-rate mortgage** wherein the interest remains constant throughout the term of the loan.

EXAMPLE 1: Mr. Garcia borrowed ₱1,000,000.00 for the expansion of the business. The effective rate of interest is 7%. The loan is to be repaid in full after one year. How much is to be paid after one year?

Solution: Given: $P = 1,000,000$ $j = 0.07$ $n = 1$

Find: F

$$F = P(1 + j)^n = 1,000,000(1 + 0.07)^1 = 1,070,000$$

An amount of ₱1,070,000.00 must be paid after one year.

EXAMPLE 2: (Chattel mortgage): A person borrowed ₱1,200,000.00 for the purchase of a car. If his monthly payment is ₱31,000.00 on a 5-year mortgage, find the total amount of interest.

Solution: Given: $P = 1,200,000$ Monthly payment = 31,000

Find: Total amount of interest

The total amount paid is given by

$$\begin{aligned}\text{Total Amount} &= (31,000)(12 \text{ months})(5 \text{ years}) \\ &= ₱1,860,000.00\end{aligned}$$



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Thus, the total interest is the difference between the total amount paid and the amount of the mortgage:

$$\begin{aligned}\text{Total Interest} &= \text{P}1,860,000.00 - \text{P}1,200,000.00 \\ &= \text{P}660,000.00\end{aligned}$$

EXAMPLE 3: If a house is sold for ₱3,000,000.00 and the bank requires 20% down payment, find the amount of the mortgage.

Solution:

$$\begin{aligned}\text{Down payment} &= (\text{down payment rate}) \times (\text{cash price}) \\ &= (0.20) (3,000,000) \\ &= 600,000\end{aligned}$$

$$\begin{aligned}\text{Amount of the Loan} &= (\text{cash price}) - (\text{down payment}) \\ &= 3,000,000 - 600,000 \\ &= 2,400,000\end{aligned}$$

The mortgage amount is ₱2,400,000.00.

Note:

In this case, the house itself is used as the mortgaged property. Also please take note that the other way to solve this is to directly compute the mortgaged amount by multiplying the cash value of the property by the percentage of the financed amount, which in this case, $100\% - 20\% = 80\%$. Thus, the amount of the loan is given by

$$(0.80) (3,000,000) = \text{P}2,400,000.00$$

EXAMPLE 4: Ms. Rosal bought a car. After paying the down payment, the amount of the loan is ₱400,000.00 with an interest rate of 9% compounded monthly. The term of the loan is 3 years. How much is the monthly payment?

Solution:

$$\text{Given: } P = 400,000 \quad i^{(12)} = 0.09 \quad j = \frac{i^{12}}{12} = \frac{0.09}{12} = 0.0075 \quad n = 36$$

Find: the regular payment R

$$\begin{aligned}&\frac{400,000.00}{R} = \left[\frac{1 - (1 + 0.0075)^{-36}}{0.0075} \right] \\ &R = 12,719.89\end{aligned}$$

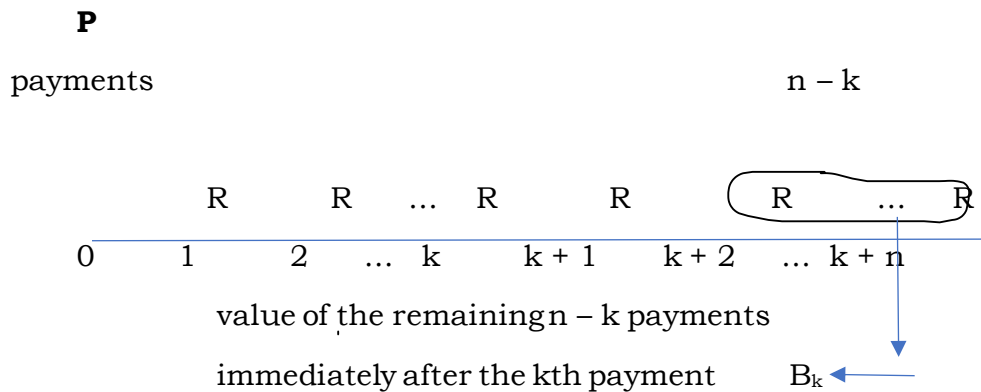
The regular payment is **₱12,719.89**.

Outstanding Balance

Recall that the outstanding balance of a loan is the amount of the loan at this time. One method to compute the outstanding balance is to get the present value of all remaining payments. This method is called the **prospective method**.



Time Diagram:



We use the symbol B_k to denote the outstanding balance after k payments. In other books, ${}_pOB_k$ is used (the “p” stands for “prospective”).

EXAMPLE 5: Mrs. Santos borrowed some money from a bank that offers an interest rate of 12% compounded monthly. Her monthly amortization for 5 years is ₱11,122.22. How much is the outstanding balance after the 12th payment?

Solution:

Given: $R = 11,122.22$ $i^{(12)} = 0.12$ $j = \frac{i^{12}}{12} = \frac{0.12}{12} = 0.01$

$k = 12$ number of payments paid $n - k = 48$ since only 48 payments remain

Find: present value of 48 future payments (since there are 48 payments left)

$$B_k = \left[\frac{1 - (1+j)^{-(n-k)}}{j} \right] = 11,122.22 \left[\frac{1 - (1.01)^{-48}}{0.01} \right] = 422,354.73$$

The outstanding balance is ₱422,354.73.

EXAMPLE 6: Mr. and Mrs. Bernal purchased a house and lot worth ₱4,000,000.00. They paid a down payment of ₱800,000.00. They plan to amortize the loan of ₱3,200,000.00 by paying monthly for 20 years. The interest rate is 12% convertible monthly.

- How much is the monthly payment?
- What is the total interest paid?
- What are the principal and interest components of the 51st payment?

Solution:

a. Given: $P = 3,200,000$ $i^{(12)} = 0.12$ $j = \frac{i^{12}}{12} = \frac{0.12}{12} = 0.01$
 $n = mt = (12)(20) = 240$

Find: regular payment R

Using the formula $P = R \left[\frac{1 - (1+j)^{-n}}{j} \right]$,

then P



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$$R = \left[\frac{1-(1+j)^{-n}}{j} \right]$$

$$\frac{3,200,000.00}{}$$

$$R = \left[\frac{1-(1+0.01)^{-240}}{0.0075} \right] = 35,234.76$$

Therefore, the monthly payment is ₱35,234.76

b. Given: P = ₱3,200,000.00 R = ₱35,234.76 n = 240

Find: total interest paid

There are 240 payments of ₱35,234.76.

The total payments is $240 \times ₱35,234.76 = ₱8,456,342.40$.

The principal is only ₱3,200,000.

$$\begin{aligned} \text{Interest Amount} &= (\text{Total payments}) - (\text{Principal}) \\ &= ₱8,456,342.40 - ₱3,200,000 \\ &= ₱5,256,342.40 \end{aligned}$$

The interest amount is ₱5,256,342.40.

Note:

Students may be surprised to learn that much of what is being computed is for the interest. This is particularly true if loan is being paid over a long period of time.

c. Given: P = ₱3,200,000.00 $i^{(12)} = 0.12$ $j = j = \frac{i^{12}}{12} = \frac{0.12}{12} = 0.01$

$$n = mt = (12)(20) = 240 \quad R = ₱35,234.76$$

Find: principal and interest components of the 51st payment

The 51st payment of ₱35,234.76 is partly used to pay for the principal, and partly to pay for the interest.

Step 1: Get the outstanding balance after the 50th payment (the balance after the 50th payment is what the 51st payment will be for).

Since 50 payments have been paid already, there will be 190 remaining payments.

The outstanding balance after the 50th payment is:

$$\begin{aligned} B_{50} &= R \left[\frac{1-(1+j)^{-190}}{j} \right] = 35,234.76 \left[\frac{1-(1+0.01)^{-190}}{0.01} \right] \\ &= ₱2,991,477.63 \end{aligned}$$

Step 2: After the 50th payment, the outstanding balance is ₱2,991,477.63.

Since the interest rate per period is $j = 0.01$, then the remaining balance of ₱2,991,477.63 will be charged an interest of the 51st payment of ₱35,234.76 will be used to pay for this interest.

Thus, the interest component of the 51st payment is ₱29,914.78.



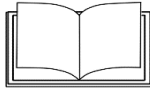
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The remaining portion of the 51st payment is the principal component, denoted by PR_{51} , is:

$$PR_{51} = R - I_{50} = \text{₱}35,234.76 - \text{₱}29,914.78 = \text{₱}5,319.98$$

Thus, for the 51st payment, the part that goes to pay the interest is ₱29,914.78 and the part that goes to pay the principal is ₱5,319.98.



What's More

Solve the following problems using the formula $F = (1 + j)^n$.

1. A loan of ₱200,000.00 is to be repaid in full after 3 years. If the interest rate is 8% per annum, how much should be paid after 3 years?
2. To purchase a house and lot worth ₱3,800,000.00, the bank requires 20% down payment. Find the mortgaged amount.
3. A car dealer offers a 15% down payment for the purchase of a car. How much is the mortgaged amount if the cash value of the car is ₱1,500,000.00?
4. If a condominium is purchased for ₱5,700,000.00 and the bank requires 30% down payment, how much is the mortgaged amount?
5. A family obtained a ₱1,000,000.00 mortgage. If the monthly payment is ₱38,000.00 for four years, how much is the total interest paid?



What I Have Learned

Write the term/expression that will complete the statements.

1. A _____ is a loan, secured by a collateral, that the borrower is obliged to pay at specific terms.
2. _____ is a mortgage on a movable property.
3. A _____ is a mortgage with a fixed interest rate for its entire term.
4. The _____ is the lender in a mortgage.
5. The _____ is the borrower in a mortgage.



What I Can Do

Solve the following problems completely.

For number 1 and 2 use the formula $B = R \left[\frac{1-(1+j)^{-n}}{j} \right]$.

1. Mr. Ramos is considering to pay his outstanding balance after 3 years of payment. The original amount of the loan is ₱100,000.00 payable annually in 5 years. If the interest rate is 10% per annum and the regular payment is ₱26,379.75 annually, how much is the outstanding balance after the 3rd payment?
2. Ms. Cruz got a business loan worth ₱900,000.00. She promised to pay the loan semi-annually in 3 years. The semi-annual payment is ₱183,026.37. If the money is worth 12% converted semi-annually, how much is the outstanding balance after the first payment?



3. A consumer loan worth ₱30,000.00 is to be repaid in 12 months at 9% convertible monthly. How much is the monthly payment. Use the formula below.

$$R = \left[\frac{P}{\frac{1-(1+j)^{-n}}{j}} \right]$$

Rubrics

Score	Description
15 points	90-100% correct answers with concrete explanation; output is neat and organized.
10 points	60-89% correct answers with an explanation; output is neat and organized.
5 points	Incomplete answer with 50% incorrect answers; output is not neat nor organized.
No point earned	No output at all



Assessment

Choose the letter that corresponds to the exact answer.

- A business loan of ₱800,000.00 is to be repaid in full after 2 years. What is the amount to be paid if the effective rate of interest is 8%?
A. ₱932,120 B. ₱933,120 C. ₱934,120 D. ₱935,120
- For the purchase of a farm worth ₱2,800,000.00, the bank requires 30% down payment. Find the mortgaged amount.
A. ₱1,960,000.00 B. ₱1,970,000 C. ₱1,980,000 D. ₱1,990,000
- If a condominium is purchased for ₱1,700,000.00 and the bank requires 25% down payment, how much is the mortgaged amount?
A. ₱1,250,000 B. ₱1,260,000 C. ₱1,270,000 D. ₱1,275,000
- Mr. Simson got a ₱1,100,000.000 mortgage. If the monthly payment is ₱33,000.00 for five years, how much is the total interest paid?
A. ₱850,000 B. ₱860,000 C. ₱870,000 D. ₱880,000
- Mr. Apostol obtained a 20-year mortgage for ₱2,200,000.00. If his monthly payment is ₱18,500.00, how much is the total interest?
A. ₱2,240,000 B. ₱2,230,000 C. ₱2,220,000 D. ₱2,210,000



Additional Activities

Answer the following problems completely. Write your solution on a clean sheet of paper.

- Mr. Portugal got a ₱700,000.00 loan for the expansion of his business payable monthly in 4 years. How much is the monthly amortization if the interest rate is 12% compounded monthly?



2. A consumer loan of ₱300,000.00 is to be repaid quarterly for 5 years. If the interest rate is 10% converted quarterly, how much is the quarterly payment?
3. A business loan of ₱650,000.00 is to be settled by paying ₱29,994.20 monthly in 2 years. If the interest rate is 10% converted monthly, how much is the outstanding balance after 6 payments?

SUMMATIVE TEST

Choose the letter of the correct answer.

For item 1 – 5, refer to the choices that illustrates each situation.

- | | |
|---------------|------------------|
| A. Mortgage | C. Consumer Loan |
| B. Collateral | D. Business Loan |

1. Mr. Lim wants to open another branch of his cellphone repair shop. He decided to apply for a loan that he can use to pay for the rentals of the new branch.
2. Mr. Trillas runs a trucking business. He wants to buy three more trucks to expand his business. He applied for a loan in a bank.
3. Mrs. Alonzo decided to take her family for a vacation. To cover the expenses, she decided to apply for a loan.
4. Glenn decided to purchase a condominium unit near his workplace. He got a loan worth ₱2,000,000.00.
5. Mr. Galang purchased and renovated her house for ₱80,000.00. This was made possible because of an approved loan worth ₱75,000.00.
6. A loan of ₱200,000.00 is to be repaid in full after 3 years. If the interest rate is 8% per annum, how much should be paid after 3 years?
A. ₱252,942.40 B. ₱ P25,942.40 C. ₱243,942.40 D. ₱250,942.40
7. For a purchase of a house and lot worth ₱3,800,000, the bank requires 20% down payment. Find the mortgaged amount.
A. ₱3,000,000 B. ₱3,100,000 C. ₱3,080,000 D. ₱3,040,000
8. A car dealer offers a 15% down payment for the purchase a car. How much is the mortgaged amount if the cash value of the car is ₱1,500,000.00?
A. ₱1,225,000 B. ₱1,230,000 C. ₱1,250,000 D. ₱1,275,000
9. If a condominium is purchased for ₱5,700,000.00 and the bank requires 30% down payment, how much is the mortgaged amount?
A. ₱3,370,000 B. ₱3,380,000 C. ₱3,990,000 D. ₱3,980,000
10. A family obtained a ₱1,000,000.00 mortgage. If the monthly payment is ₱38,000.00 for four years, how much is the total interest paid?
A. ₱624,000 B. ₱724,000 C. ₱824,000 D. ₱924,000



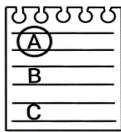


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General Mathematics: Published by the Department of Education

Chan. Miro. And Quiming. General mathematics: Published and Printed by Vibal Group Inc.



Answer Key

Lesson 1:		Lesson 2:	
What I Know		What's In	
1. B	1. Amortization	1. P251,942.40	What's More
2. A		2. P3,040,000	
3. A		3. P1,275,000	
4. B	2. Business loan	4. P3,990,000	
5. B		5. Consumer loan	
6. B	3. Guarantor		
7. A			
8. D	4. Collateral		
9. D			
10. A	5. Consumer loan		
What's More		What I Have Learned	
1. Business loan	1. Mortgage	What I Can Do	
2. Business loan	2. Chattel mortgage	1. P45,783.04	
3. Consumer loan	3. Fixed-rate mortgage	2. P770,973.65	
4. Consumer loan	4. Mortgagee	3. P2,623.54	
5. Consumer loan	5. Mortgagor		
Assessment		Additional Activities	
1. B	1. B	1. P18,433.68	
2. A	2. A	2. P19,244.14	
3. C	3. C	3. P499,428.21	
4. D	4. D		
5. A	5. A		
Summative Test			
1. D	1. D	5. C	
6. B	2. D	10. C	
7. D	3. C		
8. D	4. C		
9. C	5. C		
10. C			



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