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DEPARTMENT OF EDUCATION

General Mathematics
Quarter 2 – Module 12:
Solving Problems on Business and Consumer Loans

ALTERNATIVE DELIVERY MODE
ADM

General Mathematics
Alternative Delivery Mode
Quarter 2 – Module 12: Solving Problems on Business and Consumer Loans
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Development Team of the Module

Writers: Bayani A. Quitain

Editors: Elizabeth D. Lalunio, Anicia J. Villaruel, Roy O. Natividad

Reviewers: Jerry Punongbayan, Diosmar F. Fernandez, Celestina M. Alba,
           Shielamarie E. Arce, Carmela Ana A. Reforma, Rafaela M. Merle

Illustrator: Hanna Lorraine Luna, Diane C. Jupiter

Layout Artist: Roy O. Natividad, Sayre M. Dialola, Argie L. Ty, Glynis P. Aviles

Management Team: Francis Cesar B. Bringas
           Job S. Zape, Jr.
           Ramonito Elumbaring
           Reicon C. Condes
           Elaine T. Balaogan
           Fe M. Ong-ongowan
           Elias A. Alicaya Jr.
           Gregorio A. Co Jr.
           Gregorio T. Mueco
           Herbert D. Perez
           Lorena S. Walangsumbat
           Jee-Ann O. Borines
           Asuncion C. Ilao

General Mathematics
Quarter 2 – Module 12:
Problems on Business and Consumer Loans

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

In previous lessons, you learned how to solve simple and compound interests. In the most recent lesson, you studied the basic concepts of business and consumer loans. You understand definitions such as annuities, interests, loans and collaterals. In this lesson, you will study the application of business and consumer loans in real-life situations. To better appreciate this module let us first consider the following situations:

(a) Mario came from a poor family. His parents have no stable jobs. But due to Mario's determination, he excelled and was able to graduate college. After being permanent for 2 years in his work, Mario dreamt of providing a simple and decent shelter for his family. What do you think Mario should do?

(b) Cathy finished Senior High School in her hometown. She took a TVL strand in dressmaking, However, because of financial problems she was not able to continue in college. She decided to help her mother in their small business of dressmaking. Their business increased in production due to her hardwork. Subsequently, Cathy decided to venture in a larger scale and wished to export their Filipiniana-style products. But this would need a bigger capital. What do you think Cathy should do?

(c) During his STEM high school years, Albert was fond of experimenting on RC motors. In his engineering years in college, he creatively thought of experimenting about perpetual motion that could provide energy to machines. However, he was short of finances to start this project which is primarily Filipino-made. What do you think Albert should do?

Well, you should probably answer all three situations by finding money. Generally, it is correct. But what are the options to do that? One of the options can be found in this module. So, study diligently this module because these are all situations in which you might find yourself in the future. So, by studying this module you may be given an idea of different decisions you can make to fulfill your dream.

After going through this module, you are expected to solve problems on business and consumer loans (amortization and mortgage).
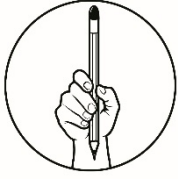
What I Know

Let's find out how far you might already know about this topic! Please take this challenge! Have Fun!

Read and analyze each item carefully. Choose the letter that corresponds to your answer for each statement and write it on a separate answer sheet.

1. It is a loan from a bank or other financial institution that helps a borrower purchase a home.
   a. collateral   b. mortgage   c. mortgagee   d. balance

2. It is the process of paying off debt with regular payments made over time.
   a. capital   b. insurance   c. mortgage   d. amortization

3. The mortgagor is the one who _____ a mortgage.
   a. borrows   b. lends   c. gives   d. transacts

4. The remaining debt at a specified time is called _____.
   a. outstanding balance   c. consumer debt
   b. foreign debt   d. maintaining balance

5. Fill in the blank to make the statement true:
   It is your _____ to repay a mortgage loan when you buy a house.
   a. duty   b. responsibility   c. obligation   d. task

6. Mr. Santos borrowed ₱1,500,000.00 to be repaid in full after 5 years with an interest rate of 6% per annum. What is the amount of the principal?
   a. 5   b. 6%   c. ₱2,007,338.00   d. ₱1,500,000.00

7. For the purchase of his car worth ₱400,000.00, Nilo requested the buyer Lito to pay him 30% down payment. How much will Lito pay Nilo for the down payment?
   a. ₱100,000.00   b. ₱280,000.00   c. ₱120,000.00   d. ₱150,000.00

8. A student loan of ₱50,000.00 was applied by Rica to support her final year in college payable in 60 consecutive months after her graduation. In how many years will she need to pay fully her student loan?
   a. 3 years   b. 5 years   c. 7 years   d. 10 years

9. Magda purchased a condominium worth ₱2,000,000.00. However, the bank demands a 25% down payment. How much is the mortgaged amount?
   a. ₱500,000.00   b. ₱1,500,000.00   c. ₱2,000,000.00   d. ₱2,500,000.00

10. A motorcycle seller offers John a 12% down payment. How much would be the mortgaged amount if the motorcycle is sellable at ₱120,000.00?

   a. ₱300,000.00   b. ₱225,600.00   c. ₱200,000.00   d. ₱105,600.00

11. Anita borrowed ₱500,000.00 from the bank to renovate her house. The effective rate of interest is 6%. How much is to be paid if the loan is to be paid in 3 years?

   a. ₱595,508.00   b. ₱530,000.00   c. ₱470,000.00   d. ₱561,800.00

12. Belle applied in a financing company for a ₱200,000.00 worth of business loan to expand her computer business. Suppose she is required by the company to pay this in 3 years, what is the amount to be paid if the effective rate of interest is 7%

   a. ₱171,735.00   b. ₱228,980.00   c. ₱245,008.60   d. ₱224,720.00

13. Mr. Arevalo borrowed from a bank to purchase a car worth ₱1,200,000.00. If he has to pay ₱30,000.00 monthly for 5 years, how much will he pay for the total interest?

   a. ₱600,000.00   b. ₱500,000.00   c. ₱400,000.00   d. ₱300,000.00

14. Ms. Binibini obtained a loan of ₱100,000.00 for a 5-year mortgage. How much will be its total interest if his monthly payment is ₱5,000.00?

   a. ₱400,000.00   b. ₱200,000.00   c. ₱500,000.00   d. ₱300,000.00

15. Aling Puring, through VIP Financing Inc, purchased a building for her new merchandise. It costs ₱2,500,000.00. She paid the financing company ₱500,000.00 as down payment. She plans to pay the remaining balance by paying monthly for 10 years with an interest rate of 12% monthly. How much would be her monthly payment?

   a. ₱28,000.50   b. ₱50,000.00   c. ₱30,000.00   d. ₱28,694.19

<table>
<tr><td>**Lesson**
1</td><td># Solving Problems on Business and Consumer Loans</td></tr>
</table>

In your previous lesson, you learned about the basic concepts of business and consumer loans. In that module, you were able to learn the definition of different terms such as consumer loans, business loans, collaterals, etc. In this module, you are going to expand and apply that knowledge in solving real-life situations concerning business and consumer loans, specifically, amortization and mortgage. This may seem new to you but as you go along through this module, it would be easier for you to sense that the contents of this module have wider applications in our daily lives. Basic definitions of amortization and mortgage, as well as mortgagee and mortgagor, will be tackled in this module. Problem-solving that entails the calculation of mortgage amount, total amount of interest, monthly payments, outstanding balance, are just some of the keywords that you will encounter in this module. So, relax and focus and who knows, you may be able to use this in the near future.

The lesson and activities in this module will explain what you have to know about real-life situations concerning consumer and business loans.

After going through this module, you are expected to solve problems on business and consumer loans (amortization and mortgage).

What's In

In your most recent lesson, you learned the basics of consumer and business loans. Moreover, in previous lessons, you were taught how to calculate simple and compound interests as well as annuities. As a review, ready yourself in doing this first activity.

Activity 1

Based on your knowledge of the previous lessons, try solving the following problems:

1. How much interest is charged when ₱100,000.00 is borrowed for 6 months at an annual simple interest rate of 12%?

2. Find the maturity value and the compound interest if ₱15,000 is compounded annually at an interest rate of 3% in 3 years.

3. Rina started to deposit ₱3,000.00 quarterly in a fund that pays 2% compounded quarterly. How much will be in the fund after 5 years?

Activity 2

Identify which of the following statements belong to either consumer or business loans. Write the number of each statement to its corresponding column inside the table below.

1. Maria wants to borrow money from a financing agency for her college education.

2. Mang Pedro would like to improve his auto-repair shop. He went to the bank to borrow money to finance his plan to buy some equipment.

3. Rico finds it hard to travel to and from his workplace. So, he filed a loan from a bank for him to purchase a motorcycle.

4. Mr. Ramsy would like to open a computer shop, but he was short of capital. So, he went to the bank and file for a loan to purchase computers and other equipment.

Consumer Loans	Business Loans

What's New

Most people think about the security and comfort of their families. This security and comfort include the provision of a house and in case of a far workplace by having a personal car or motorcycle. However, a large amount of money is needed to buy them in straight cash. Recently, the government implemented a program called the Balik-Probinsya, Balik-Pag-asa program that will provide resources for those who will be coming back to provinces from Manila to start a new life. This may mean having something to provide for the stability of a family such as a house or maybe a motorcycle in less amount. A house to provide for the family shelter while a motorcycle may be necessary as a means of transportation to report to work. But despite the help the government may provide, this still seems difficult to have if you have no cash on hand. So, you will resort to what we call a loan. In this module, we will call it a mortgage.

Questions:
1. What do you understand about the word "loan" or "mortgage"?
   _____
2. Do you think anyone can file for a loan from a bank or any financial institution? _____
3. Enumerate some government institutions or private agencies wherein you can apply for a mortgage of a house or any vehicle?
   _____

4. Which do you think is more proper: to buy a motorcycle, using a straight cash or using a mortgage? Why?

   _____

5. Do you think it is appropriate to pay an obligation such as a loan or mortgage? Why?

   _____
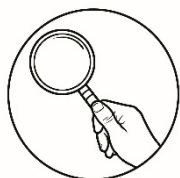
What is It

You have noticed from the beginning of this module that you were given situations that have real-life applications. Again, this module is about solving problems involving consumer and business loans. A loan is something borrowed, especially a certain amount, that you are obligated to pay fully at a certain period with interest. So, for instance a bank may lend you a capital of ₱500,000.00 for your intended business but you must pay it fully at a certain period of time for instance in 3 years with 12% interest per annum. The following examples will help you with amortization and mortgage. But before that, let us learn some terms which can guide you as you study this module:

Amortization is the process of paying off debt with regular payments made over time.
Mortgage is a loan from a bank or other financial institutions that help a borrower purchase a home or a car.
Mortgagor is the one who borrows a mortgage.
Mortgagee is the one who lends a mortgage.
Collaterals are assets that can secure a loan.
Fixed-rate mortgage is a type of mortgage where interest remains constant.
Obligation is what parties may do under a contract or terms of agreement.
Outstanding balance is any remaining debt at a specified time.

Let us now go to the computation process.

Example 1

Mario came from a poor family. His parents have no stable jobs. But due to Mario's determination, he excelled and was able to graduate college. After being permanent for 2 years in his work, Mario dreamt of providing a simple and decent shelter for his family. He went to the bank and applied for ₱1,000,000.00 loan. The bank approved his application with the following terms: 10% down payment, 12% total interest, and must be paid in full after 5 years.
   a. How much is his mortgaged amount?
   b. How much should he have paid after 5 years?

Solution:

(a) Down payment = (down payment rate) x (amount of loan applied)

= (0.10) (₱1,000,000.00)

= ₱100,000.00

Thus,

Mortgaged amount = (amount of loan applied) – (down payment)

= ₱1,000,000.00 – ₱100,000.00

= ₱ 900,000.00

Therefore, Mario has a mortgaged amount of ₱900,000.00.

(b) Given P = ₱ 900,000.00, j = 0.12, n = 5
$F = P(1 + j)^n$ = 900,000(1+0.12)⁵ = ₱1,586,107.51

Therefore, Mario should have paid ₱1,586,107.51 after 5 years.

Example 2

Cathy finished Senior High School in her hometown. She took a TVL strand in dressmaking, However, because of financial incapacity, she was not able to continue in college. She decided to help her mother in their small business of dressmaking. Their business increased in production due to her hard work. Subsequently, Cathy decided to venture on a larger scale and wished to export their Filipiniana-style products. But this would need a bigger capital. So, she decided to go to a financing institution, Phiram Inc., to borrow ₱500,000.00. If her monthly payment was ₱12,000.00 on a 5-year mortgage, how much was the total amount of interest?

Solution:

Given P = ₱500,000.00, monthly payment = ₱12,000.00
Total Amount = (₱12,000.00) (12 months) (5 years) = ₱720,000.00
Total Amount of Interest = Total Amount – Amount of mortgage

= ₱720,000.00 – ₱500,000.00 = ₱220,000.00

Therefore, the total amount of interest is ₱220,000.00

Example 3

During his STEM high school years, Albert was fond of experimenting on RC motors. In his engineering years in college, he creatively thought of experimenting about perpetual motion that could provide energy to machines. However, he was short of finances to start this project which is primarily Filipino-made. AG Resibo Company approached Albert, and offered to lend him a capital of ₱2,000,000.00 to be paid in 5 years with 10% monthly interest. Moreover, there is an outright deduction of 100,000 from his applied loan.
(a) How much is his monthly payment?

Solution:

(a) Given P = ₱1,900,000.00 i^{12} = 0.10 $j = \dfrac{i^{12}}{12} = \dfrac{0.10}{12} = .00833;$

n = mt = (12)(5) = 60

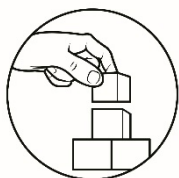Use the formula:

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

In finding R, Regular (monthly) payment, we use:

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

By substitution we have,

$$R = ₱1,900,000.00 \Big/ \left[\frac{1-(1+.00833)^{-60}}{.00833}\right]$$

$$R = ₱40,365.65$$

Therefore, the monthly payment is ₱40,365.65.

What's More

Read each problem carefully and answer each question to solve the problem.

Activity 1.1

1. A business loan of ₱200,000 is to be repaid in full after 2 years. What is the amount to be paid if the effective rate of interest is 10%? (Hint: $F = P(1+j)^n$)

2. Johna purchased a condominium worth ₱3,500,000. However, the bank demands a 10% down payment. How much is the mortgaged amount?

3. A motorcycle seller requires Justo ₱5,000 down payment. How much would be the mortgaged amount if the motorcycle is sellable at ₱120,000?

Activity 1.2

Solenn decided to venture in an online business and opted to go to a financing institution to borrow ₱50,000. If her monthly payment is ₱1,500 on a 5-year mortgage, how much is the total amount of interest?

Activity 1.3

PC Yaw Inc. approached Rudy and offered to lend him a capital for his computer business amounting to ₱300,000 to be paid in 3 years with 12% monthly interest. How much would be his monthly payment?

What I Have Learned

A. Again, this module is about solving problems in consumer and business loans. A loan is something borrowed, especially a certain amount, that you are obligated to pay fully at a certain period with interest. Fill each blank with correct term/s which are related to consumer and business loans.

_____ is the process of paying off debt with regular payments made over time.

_____ is a loan from a bank or other financial institutions that helps a borrower purchase a home or a car.

_____ is the one who borrows a mortgage.

_____ is the one who lends a mortgage.

_____ are assets that can secure a loan.

B. Enumerate the different formulas that you should know to solve problems involving consumer and business loans.
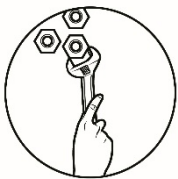
What I Can Do

1. Create your own or similar real-life situation where consumer and business loans are applied. Conduct a thorough search by looking for any Philippine bank or institution that offer any loans. Attach the screenshot of your search.
2. In a bond paper, present the problem and write the current interest rate being charged by your chosen bank or institution. Compute for the following:
   - (a) Mortgaged Amount
   - (b) Monthly installment
   - (c) Total amount paid
   - (d) Total amount of interest

Note that your grade will be according to the criteria below: Accuracy of research data (50%), Accuracy of solution (40%), and Applicability to the current situation (10%).
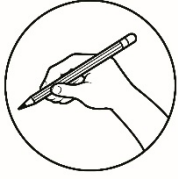
Assessment

Read and analyze each item carefully. Choose the letter that corresponds to your answer for each statement and write it on a separate answer sheet.

1. These are assets used to secure a loan.
   - a. collateral
   - b. mortgage
   - c. mortgagee
   - d. balance

2. It is a type of mortgage where the interest remains constant throughout the term of the loan.
   - a. capital
   - b. insurance
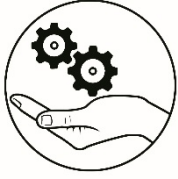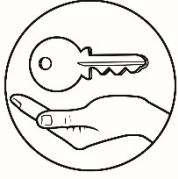   - c. fixed-rate mortgage
   - d. amortization

3. The mortgagee is the one who _____ in a mortgage.
   - a. borrows
   - b. lends
   - c. gives
   - d. transacts

4. Ms. Cuyo borrowed a loan of ₱500,000.00 to be repaid in full after 3 years with an interest rate of 12% per annum. What is its interest rate in decimal form?
   - a. 5000
   - b. 12%
   - c. 0.12%
   - d. 0.12

5. Joey borrowed ₱50,000.00 from a financing institution. His final loan amount is ₱48,000.00 due to the deduction of the down payment. How much is the down payment?
   - a. ₱1,000.00
   - b. ₱2,000.00
   - c. ₱48,000.00
   - d. ₱50,000.00

6. Mr. Santos borrowed ₱2,500,000.00 to be repaid in full after 10 years with an interest rate of 10% per annum. What is the amount of the principal?
   - a. 10
   - b. 10%
   - c. ₱2,500,000.00
   - d. ₱2,750,000.00

7. For the purchase of her motorcycle worth ₱200,000.00, Mila requested the buyer, Lita, to pay him 25% down payment. How much will Lita pay Mila for the down payment?
   - a. ₱50,000.00
   - b. ₱100,000.00
   - c. ₱150,000.00
   - d. ₱180,000.00

8. A student loan of ₱30,000.00 was applied by Bebot to support her final year in college payable in 3 consecutive years after her graduation. In how many months will she need to pay fully her student loan?
   - a. 12 months
   - b. 24 months
   - c. 36 months
   - d. 60 months

9. A ₱20,000,000.00 worth of beach resort was bought by Mr. Sy through ABC Bank. However, the bank demands a 20% down payment. How much is the mortgaged amount?
   a. ₱400,000.00
   b. ₱800,000.00
   c. ₱4,000,000.00
   d. ₱16,000,000.00

10. A car dealer offers Ms. Garcia a brand-new car worth ₱420,000.00 with a 15% down payment. How much would be the mortgaged amount?
    a. ₱100,000.00
    b. ₱125,600.00
    c. ₱200,000.00
    d. ₱357,000.00

11. Patty borrowed ₱800,000.00 from the bank to develop her piggery. The effective rate of interest is 9%. How much is to be paid if the loan is to be paid in 4 years?
    a. ₱1,129,265.00
    b. ₱1,170,000.00
    c. ₱1,223,089.00
    d. ₱1,361,800.00

12. A ₱600,000.00 worth of business loan was applied by Basilio from XYZ Bank to expand his poultry business. Suppose he is required by the company to pay this in 5 years, what is the amount to be paid if the effective rate of interest is 8%?
    a. ₱746,265.00
    b. ₱881,596.80
    c. ₱895,008.00
    d. ₱924,720.00

13. Mr. Alvarez borrowed from a bank to purchase a farm lot worth ₱1,800,000.00. If he has to pay ₱20,000.00 monthly for 9 years, how much will he pay for the total interest?
    a. ₱320,000.00
    b. ₱340,000.00
    c. ₱360,000.00
    d. ₱380,000.00

14. Ms. Diamante obtained from a financing company a loan of ₱3,000,000.00 to expand her jewelry business for a 6-year mortgage. How much will be its total interest if his monthly payment is ₱50,000.00?
    a. ₱200,000.00
    b. ₱300,000.00
    c. ₱4000,000.00
    d. ₱600,000.00

15. Mang Akoy, through Alang-Ala Financing Inc. (AFI), purchased a grocery store for her spouse that costs ₱75,000.00. He paid AFI ₱10,000.00 as down payment. He plans to pay the remaining balance by paying monthly for 3 years with an interest rate of 7% monthly. How much would be his monthly payment?
    a. ₱3,000.50
    b. ₱2,807.82
    c. ₱2,632.33
    d. ₱2,007.21

Additional Activities

Solve the following:

1. A business loan worth ₱500,000.00 is to be repaid in quarterly installment in 3 years. How much is the quarterly payment if money is worth 10% converted quarterly?

2. A newly married couple decided to buy a brand-new car. The net amount of the loan is ₱800,000.00. They plan to amortize the loan in a monthly installment for 3 years, if money is worth 12% convertible monthly, how much is the monthly installment?

3. A business loan worth ₱500,000.00 is to be repaid in quarterly installment in 3 years. How much is the quarterly payment if money is worth 10% converted quarterly?

4. A newly married couple decided to buy a brand-new car. The net amount of the loan is ₱800,000.00. They plan to amortize the loan un monthly installment for 3 years, if money is worth 12% convertible monthly, how much is the monthly installment?

Answer Key

What I Know

1. B
2. D
3. A
4. A
5. C
6. D
7. C
8. B
9. B
10. D
11. A
12. C
13. A
14. B
15. D

What's More

Activity 1.1
1. ₱242,000
2. ₱3,150,000
3. ₱115,000

Activity 1.2
1. ₱40,000

Activity 1.3
1. ₱9,964.293

Assessment

1. A
2. C
3. B
4. D
5. B
6. C
7. A
8. C
9. D
10. D
11. A
12. B
13. C
14. D
15. D

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Khan Academy. 2020. Mortgage interest rates. https://www.khanacademy.org/ economics-finance-domain/core-finance/housing/mortgages-tutorial/v/ mortgage-interest-rates