UNIT 10

Mortgages





Calculating mortgages is a crucial skill in financial literacy that can empower you to make informed decisions when purchasing or refinancing a home. Understanding the intricacies of mortgage calculations enables you to determine affordability, compare loan options, and plan your finances effectively. It allows you to learn how to assess your financial situation, considering income, expenses, and debt-to-income ratio to determine how much of a mortgage you can afford. By comparing different mortgage options, you can analyze interest rates, loan terms, and down payment requirements to make reasonable decisions. Calculating mortgage payments also allows you to include them in your monthly budgets and plan your overall financial goals effectively.

Key Concepts

- Principal: The initial loan amount borrowed to purchase a home.
- Interest Rate: The annual percentage rate charged by the lender for borrowing the funds.
- Loan Term: The duration of the mortgage, typically expressed in years.
- Down Payment: The initial payment made by the borrower, reducing the principal amount.
- Amortization: The process of gradually paying off the mortgage through regular payments.
- Monthly Payment: The amount to be paid by the borrower each month, comprising principal and interest.
- Total Interest Paid: The cumulative interest paid over the entire loan term.

10.1 Mortgage Payments

The formula for calculating mortgage payments is based on the concept of amortization, which involves spreading out the

repayment of a loan over a specific period of time, the same formula we used in the loan amortization section.

$$M = P \times (r \times (1 + r)^n) / ((1 + r)^n - 1)$$

Where:

M = Monthly mortgage payment

P = Principal loan amount (the initial amount borrowed)

r = Monthly interest rate (annual interest rate divided by 12 months)

n = Total number of monthly payments (loan term in months)

Let's break down the formula step by step:

Step 1: Calculate the monthly interest rate. To determine the monthly interest rate, divide the annual interest rate by 12 to convert it to a monthly rate. For example, if the annual interest rate is 5%, the monthly interest rate would be 0.05/12 = 0.004167.

Step 2: Calculate the total number of monthly payments. To calculate the total number of monthly payments, multiply the number of years in the loan term by 12. For example, if the loan term is 25 years, the total number of monthly payments would be 25 x 12 = 300.

Step 3: Calculate the monthly mortgage payment. Using the values obtained from steps 1 and 2, plug them into the formula:

$$M = P \times (r \times (1 + r)^n) / ((1 + r)^n - 1)$$

This formula takes into account the loan amount, interest rate, and loan term to determine the fixed monthly payment required to fully repay the mortgage over the specified period.

By substituting the values for P, r, and n into the formula, you can calculate the monthly mortgage payment.

It is important to note that this formula assumes a fixed interest rate for the entire loan term. In the case of adjustable-rate mortgages where the interest rate can change or vary over time, the formula may differ or additional calculations may be required to account for rate adjustments. Additionally, the formula does not account for other costs associated with homeownership, such as property taxes and insurance which may be applicable in certain cases.

Let's calculate monthly mortgage payments. The first one has been solved for you.

1 Shahad takes out a mortgage loan of $300,000 at an annual interest rate of 4.5%. The loan term is 25 years. Calculate her monthly mortgage payment.

SOLUTION

$M = \$300{,}000 \times (0.00375 \times (1 + 0.00375)^{300})$
$((1 + 0.00375)^{300} - 1)$

Calculate $(1 + 0.00375)^{300}$ and $((1 + 0.00375)^{300} - 1)$ separately.

$(1 + 0.00375)^{300} = 3.073742528$

$((1 + 0.00375)^{300} - 1) = 2.073742528$

Monthly payment = $\$300{,}000 \times (0.00375 \times 3.073742528) / 2.073742528$

Monthly payment = $1,667.50

2 If you take out a 25 year mortgage loan in the amount of $300,000 with a monthly payment of $1,667.50, what is the (a) total cost of borrowing (principal + interest) and (b) total interest paid?

3 You are purchasing a house for $500,000. You have saved $100,000 for a down payment. What percentage of the purchase price is the down payment?

4 You want to purchase a house for $400,000. You have saved $80,000 for a down payment. What is the mortgage loan amount that you require?

5 You are purchasing a house for $250,000. The bank requires a down payment of 20%. How much is the down payment?

6 You are purchasing a house for $350,000. You have saved $70,000 as a down payment. What percentage of the purchase price is the down payment?

7 Determine the total number of monthly payments for a 30-year mortgage.

8 A homeowner has a mortgage loan of $250,000 with an annual interest rate of 4%, and a mortgage term of 3 years. Calculate the monthly mortgage payment.

9 Mark has a mortgage loan of $400,000 with an annual interest rate of 3.5% and a 12 year term. Estimate the annual interest paid within the first 12 months.

10 Kawar has a mortgage loan of $150,000 with an annual interest rate of 5.25% over a 25 year term. Calculate his monthly interest paid during the first year.

11 Yunus has a mortgage loan of $350,000 with an annual interest rate of 4% and a term of 15 years. Calculate his monthly mortgage payment.

12 Tolga secures a mortgage loan of $250,000 at an annual interest rate of 3.75%. The loan term is 30 years. What is the total of mortgage payments at the end of the first year?

13 A homeowner takes out a mortgage loan of $400,000 at an annual interest rate of 5%. The loan term is 20 years. Calculate the monthly mortgage payment.



14 A homeowner takes out a mortgage loan of $500,000 at an annual interest rate of 4.25%. The loan term is 15 years. Calculate the monthly mortgage payment.

15 Barry secures a mortgage loan of $350,000 at an annual interest rate of 7%. The loan term is 20 years. How much interest does he pay per month the first year?

16 Pique takes out a mortgage loan of $400,000 at an annual interest rate of 5%. The loan term is 30 years. Calculate the total amount of interest Pique will pay for the entire term of the mortgage.

17 Talal wants to buy a house for $175,000. He has to pay a down payment of 15% and decides to get a mortgage for the remaining balance at an annual interest rate of 8% for 25 years. What is the total cost of borrowing (principal + interest)?

18 Shazia's monthly mortgage payment on her townhouse is $965.23. She also has to pay annual property tax of $2,356. How much mortgage and property tax must Shazia pay per month?

19 Mikey has a home valued at $1,900,000. Property tax in his district is charged at an annual rate of 7% of the value of property. How much property tax does Mikey have to pay?