**TIME VALUE OF MONEY**

**EXERCISES**

**PMT with Balloon Payment**

**Problem 1: Car Loan with Balloon Payment**

A car loan of **$15,000** is taken at an annual interest rate of **5%** for **4 years**. The borrower agrees to a balloon payment of **$5,000** at the end of the loan term. Calculate the monthly payment using the following formula in Excel:

What is the monthly payment?

**Problem 2: Home Renovation Loan**

A homeowner takes out a **$20,000** loan for home renovations at an annual interest rate of **6%** for **3 years**, with a balloon payment of **$7,000** at the end of the term. Use the same Excel formula to calculate the monthly payment:

What is the monthly payment?

**Problem 3: Business Equipment Loan**

A small business takes out a loan of **$50,000** to purchase equipment, with an annual interest rate of **7%** and a loan term of **5 years**. To reduce payments, the lender offers a balloon payment of **$15,000** at the end of the term. Payments are made **quarterly**.

Calculate the quarterly payment using the formula:

**Problem 4: Vacation Home Loan**

A family purchases a vacation home with a loan of **$75,000** at an annual interest rate of **4.5%** for **10 years**. They plan to make a balloon payment of **$25,000** at the end of the term. Payments are made **annually**.

Calculate the annual payment

**Problem 5: Student Loan Refinancing**

A student refinances their education loan with a balance of **$30,000** at an annual interest rate of **5.5%** for **6 years**. To lower payments, the refinancing agreement includes a balloon payment of **$10,000** at the end of the term. Payments are made **semiannually**.

Calculate the semiannual payment

**PMT without Balloon Payment**

**Problem 6: Farm Equipment Loan**

A farmer takes a loan of **$40,000** to purchase machinery at an annual interest rate of **6.5%**, with a loan term of **7 years**. The agreement includes a balloon payment of **$10,000** at the end of the term.  
**Calculate the monthly payment**

**Problem 7: Construction Loan**

A developer takes out a construction loan of **$500,000** for a housing project at an annual interest rate of **5%**, with a loan term of **10 years**. The agreement specifies a balloon payment of **$200,000** at the end of the loan period.  
**Calculate the monthly payment**

**Problem 8: Auto Loan**

An individual buys a car with a loan of **$25,000** at an annual interest rate of **4%**, with a loan term of **3 years**. The dealer offers a balloon payment of **$7,500** at the end of the term to reduce monthly payments.  
**Calculate the monthly payment**

**Problem 9: Small Business Expansion Loan**

A small business owner borrows $100,000 at an annual interest rate of 8% for 8 years to expand operations. To manage cash flow, the lender includes a balloon payment of $20,000 at the end of the loan term. Payments are made quarterly.

Calculate the quarterly payment

**Problem 10: Medical Loan**

A person takes out a medical loan of $12,000 at an annual interest rate of 7% for 5 years, with a balloon payment of $2,500 at the end of the term. Payments are made annually.

Calculate the annual payment

**PPMT AND IPMT functions**

**Problem01:** A borrower takes a loan of **$10,000** at an annual interest rate of **6%**, with a loan term of **5 years**. The loan is repaid in **monthly installments**. The goal is to calculate the **monthly payment**, break it down into **principal** and **interest** portions for each payment, and determine the **total loan cost**.

1. **Monthly Payment**:
2. **Principal and Interest Breakdown for Each Payment**:
   * Calculate the **principal portion** of each monthly payment using the PPMT function:
   * Calculate the **interest portion** of each monthly payment using the IPMT function:

**Future value lumpsum payment**

**Problem0: Future Value of an Investment (₹)**

You decide to invest a lump sum of **₹8,00,000** in an account that offers an annual interest rate of **6%**, compounded annually, for a term of **8 years**. No additional deposits are made during this period.

1. Calculate the **future value** of this investment using the FV function in Excel:
2. **Total Return**: Calculate the total return by subtracting the initial investment (₹8,00,000) from the future value.

**Problem 1: Retirement Fund Investment**

You invest a lump sum of ₹10,00,000 in a retirement account that offers an annual interest rate of 7%, compounded **semiannually**, for a term of 10 years. No additional deposits are made during this period.

1. Calculate the future value of this investment using the FV function in Excel.
2. Calculate the total return by subtracting the initial investment from the future value.

**Problem 2: Education Savings Plan**

A parent deposits a lump sum of ₹5,00,000 into an education savings plan for their child. The plan offers an annual interest rate of 5.5%, compounded **quarterly**, for a term of 12 years. No additional deposits are made during this period.

1. Calculate the future value of this investment using the FV function in Excel.
2. Calculate the total interest earned by subtracting the initial deposit from the future value.

**Problem 3: Property Investment**

An investor places a lump sum of ₹15,00,000 into a real estate fund that offers an annual interest rate of 8%, compounded **monthly**, for a term of 6 years. No periodic deposits are made.

**Tasks:**

1. Use the FV function in Excel to calculate the future value of this investment.
2. Calculate the total earnings by subtracting the initial deposit from the future value.

**Problem 4: Long-Term Fixed Deposit**

An individual invests ₹20,00,000 in a long-term fixed deposit scheme offering an annual interest rate of 6.5%, compounded **weekly**, for 15 years. No additional contributions are made during the term.

**Tasks:**

1. Calculate the future value of this fixed deposit using the FV function in Excel.
2. Compute the total interest earned by subtracting the initial investment from the future value.

**The future value of a series of deposits**

**Problem 1: Vacation Fund**

A family plans to save for a vacation by depositing ₹3,000 at the end of each quarter into a savings account. The account offers an annual interest rate of 5%, compounded quarterly, for a term of 5 years.

**Tasks:**

1. Calculate the future value of the series of quarterly deposits using the FV function in Excel.
2. Calculate the total amount deposited and compare it with the future value to find the total interest earned.

**Problem 2: Education Fund**

A parent wants to save for their child’s education by depositing ₹10,000 at the end of each year in an investment account that offers an annual interest rate of 7%, compounded annually, for a term of 12 years.

**Tasks:**

1. Calculate the future value of the education fund using the FV function in Excel.
2. Calculate the total amount deposited over the 12 years and find the total interest earned.

**Problem 3: Retirement Savings**

An individual starts saving for retirement by depositing ₹20,000 at the end of each half-year into a retirement account. The account provides an annual interest rate of 8%, compounded semiannually, and the term of the investment is 15 years.

**Tasks:**

1. Calculate the future value of the retirement savings using the FV function in Excel.
2. Calculate the total amount deposited over 15 years and find the total interest earned.

**Problem 4: Emergency Fund**

A person creates an emergency fund by depositing ₹2,500 at the end of each week into a high-interest savings account. The account offers an annual interest rate of 6.5%, compounded weekly, and the term is 10 years.

**Tasks:**

1. Calculate the future value of the emergency fund using the FV function in Excel.
2. Calculate the total amount deposited and find the total interest earned.

**WORKING TOWARD AN INVESTMENT GOAL**

**Problem0: Determining the Required Interest Rate**

You want to accumulate ₹50,00,000 in 15 years to fund your retirement. You can start with an initial deposit of ₹5,00,000 and make additional monthly contributions of ₹10,000 at the end of each month. What annual interest rate is required to meet this goal?

Tasks:

1. Use the RATE function in Excel to calculate the required monthly interest rate:
2. Multiply the monthly interest rate by 12 to calculate the annual interest rate.

**Problem 1: College Education Fund (Initial Deposit)**

You want to accumulate **₹30,00,000** over the next **12 years** to fund your child’s college education. You can start with an initial deposit of **₹2,00,000** and make quarterly contributions of **₹50,000** at the end of each quarter. What annual interest rate is required to meet this goal?

**Tasks:**

1. Use the RATE function to calculate the required quarterly interest rate.
2. Multiply the quarterly interest rate by 4 to find the **annual interest rate**.

**Problem 2: Dream Vacation Fund (Initial Deposit)**

You want to save **₹10,00,000** over the next **5 years** for a dream vacation. You can start with an initial deposit of **₹1,50,000** and make annual contributions of **₹1,20,000** at the end of each year. What annual interest rate is required to meet this goal?

**Tasks:**

1. Use the RATE function to calculate the required annual interest rate.

**Problem 3: Emergency Fund (No Initial Deposit)**

You want to save **₹5,00,000** for an emergency fund over the next **10 years**. You plan to deposit **₹4,000** at the end of every month. There is no initial deposit. What annual interest rate is required to meet this goal?

**Tasks:**

1. Use the RATE function to calculate the required monthly interest rate.
2. Multiply the monthly interest rate by 12 to find the **annual interest rate**.

**Problem 4: Retirement Fund (No Initial Deposit)**

You want to save **₹1,00,00,000** for retirement in the next **20 years**. You plan to deposit **₹1,50,000** at the end of each half-year (biannual deposit). There is no initial deposit. What annual interest rate is required to meet this goal?

**Tasks:**

1. Use the RATE function to calculate the required half-year interest rate.
2. Multiply the half-year interest rate by 2 to find the **annual interest rate**.

**Calculating the required number of periods**

**Problem0: Calculating the Required Number of Periods**

You want to retire with **₹2,00,00,000** in your retirement account. You have an initial deposit of **₹10,00,000** and can afford to deposit **₹25,000** at the end of each month. The account offers an annual interest rate of **6%, compounded monthly**.

How long will it take to reach your goal?

**Tasks:**

1. Use the NPER function in Excel to calculate the **number of months** required to reach the goal:

=NPER(rate, pmt, pv, fv, type)

1. Convert the result into years by dividing the number of months by 12.

**Problem 1: Education Fund (Monthly Deposits with Initial Deposit)**

You want to save **₹50,00,000** for your child’s education. You start with an initial deposit of **₹5,00,000** and plan to deposit **₹10,000** at the end of each month into an account offering an annual interest rate of **7%**, compounded monthly.

**How long will it take to reach your goal?**

**Problem 2: Emergency Fund (Quarterly Deposits without Initial Deposit)**

You want to build an emergency fund of **₹10,00,000**. You plan to deposit **₹25,000** at the end of every quarter into an account that offers an annual interest rate of **6%, compounded quarterly**.

**How long will it take to reach your goal?**

**Problem 3: Retirement Fund (Annual Deposits with Initial Deposit)**

You want to retire with **₹3,00,00,000**. You start with an initial deposit of **₹20,00,000** and plan to deposit **₹5,00,000** at the end of each year into an account offering an annual interest rate of **8%, compounded annually**.

**How long will it take to reach your goal?**

**Problem 4: Vacation Fund (Weekly Deposits without Initial Deposit)**

You want to save **₹5,00,000** for a dream vacation. You plan to deposit **₹2,000** at the end of each week into a high-interest savings account offering an annual interest rate of **5.5%, compounded weekly**.

**How long will it take to reach your goal?**

**Calculating the required regular deposit**

**Problem0: Calculating the Required Regular Deposit**

You want to accumulate **₹1,00,00,000** in your investment account in **20 years** to purchase your dream home. You have no initial deposit and the account offers an annual interest rate of **5%, compounded monthly**.

**How much do you need to deposit at the end of each month to reach your goal?**

**Tasks:**

1. Use the PMT function in Excel to calculate the required **monthly deposit**:

scss

**Problem 1: Retirement Fund (Monthly Deposits)**

You want to save **₹1,50,00,000** in your retirement account over the next **25 years**. You have no initial deposit, and the account offers an annual interest rate of **6%, compounded monthly**.

**How much do you need to deposit at the end of each month to reach your goal?**

**Problem 2: Education Savings Fund (Quarterly Deposits)**

You want to save **₹40,00,000** to fund your child’s education over the next **15 years**. You have no initial deposit, and the account offers an annual interest rate of **7%, compounded quarterly**.

**How much do you need to deposit at the end of each quarter to reach your goal?**

**Problem 3: Emergency Fund (Annual Deposits)**

You want to build an emergency fund of **₹20,00,000** over the next **10 years**. You have no initial deposit, and the account offers an annual interest rate of **5%, compounded annually**.

**How much do you need to deposit at the end of each year to reach your goal?**

**Problem 4: Vacation Fund (Weekly Deposits)**

You want to save **₹5,00,000** to go on a dream vacation in **5 years**. You have no initial deposit, and the account offers an annual interest rate of **4.5%, compounded weekly**.

**How much do you need to deposit at the end of each week to reach your goal?**