

## Tasks 08-02 - Annuities & Loan Amortization

### Section 08: Financial Mathematics

#### Problem 1: Future Value of Ordinary Annuity (x)

Calculate the future value of each ordinary annuity:

- a) 200 per month for 5 years at 6% annual interest
- b) 500 per month for 10 years at 4% annual interest
- c) 1,000 per quarter for 8 years at 8% annual interest
- d) 3,000 per year for 15 years at 5% annual interest

#### Problem 2: Present Value of Ordinary Annuity (x)

Calculate the present value of each ordinary annuity:

- a) 400 per month for 4 years at 6% annual interest
- b) 1,500 per month for 20 years at 5% annual interest
- c) 2,000 per quarter for 10 years at 8% annual interest
- d) 5,000 per year for 25 years at 4% annual interest

#### Problem 3: Finding the Payment (xx)

Find the required payment for each scenario:

- a) Save for 100,000 in 20 years at 5% compounded monthly
- b) Pay off a 30,000 loan in 5 years at 6% compounded monthly
- c) Save for 50,000 in 10 years at 4% compounded quarterly
- d) Pay off a 200,000 mortgage in 30 years at 4.5% compounded monthly

#### Problem 4: Finding Number of Payments (xx)

How many payments are needed for each scenario?

- a) 15,000 loan at 6% monthly, 350/month payments
- b) 40,000 loan at 4.8% monthly, 800/month payments
- c) Save 75,000 at 5% monthly by saving 400/month

#### Problem 5: Annuity Due vs. Ordinary Annuity (xx)

For each scenario, calculate both the ordinary annuity and annuity due values:

- a) FV of 500/month for 10 years at 6%
- b) PV of 1,000/month for 5 years at 4%

#### Problem 6: Loan Payment Calculation (x)

Calculate the monthly payment for each loan:

- a) 20,000 car loan at 5.5% for 4 years
- b) 150,000 mortgage at 4.2% for 25 years
- c) 8,000 personal loan at 9% for 3 years
- d) 35,000 business loan at 6.5% for 7 years

### Problem 7: Amortization Schedule (xxx)

Create the first 4 rows of an amortization schedule for a 12,000 loan at 6% annual interest for 2 years (monthly payments).

Payment #	Payment	Interest	Principal	Balance
0	-	-	-	?
1	?	?	?	?
2	?	?	?	?
3	?	?	?	?
4	?	?	?	?

### Problem 8: Outstanding Balance (xx)

For a 180,000 mortgage at 4.8% annual for 30 years (monthly payments):

- a) Calculate the monthly payment.
- b) Find the outstanding balance after 5 years (60 payments).
- c) Find the outstanding balance after 15 years (180 payments).
- d) How much total interest is paid over the life of the loan?

### Problem 9: Retirement Planning (xxx)

Maria wants to retire with 800,000 Euro in her retirement account. She's 30 years old and plans to retire at 65.

- a) If her account earns 6% compounded monthly, how much must she save monthly?
- b) If she can only save 500/month, what rate of return does she need?
- c) If she delays starting by 5 years (starts at 35), how much more per month must she save at 6%?

### Problem 10: Comparing Loan Options (xxx)

You need to borrow 25,000 for a car. Compare these options:

Option A: 4.9% APR for 48 months Option B: 3.9% APR for 60 months Option C: 0% APR for 36 months (but 1,000 rebate lost)

- a) Calculate the monthly payment for each option.
- b) Calculate the total cost (payments minus any rebate) for each.
- c) Which option is best financially?

### **Problem 11: Business Equipment Lease (xxx)**

A company needs equipment worth 80,000. They can either:

- Buy: Pay 80,000 now
- Lease: Pay 1,800/month for 4 years, then return the equipment

At a 5% discount rate:

- a) What is the present value of the lease payments?
- b) If the equipment has a resale value of 15,000 after 4 years, which option is better?
- c) At what resale value would the two options be equivalent?

### **Problem 12: Mixed Annuity Problem (xxxx)**

The Muller family is planning for their child's education. They start saving when their child is born and need 150,000 when the child turns 18.

- a) If they save monthly at 5% annual return, what monthly payment is needed?
- b) After 10 years of saving, how much have they accumulated?
- c) At that point (child is 10), they receive an inheritance of 40,000 and add it to the account. What is their new required monthly payment for the remaining 8 years?
- d) Alternatively, if they keep the same payment from part (a), how much extra will they have at age 18?