

|  |  |  |
| --- | --- | --- |
| Mathematics Department | |  |
| Course: ATMAA | |
| Topic Title: Loans and Investments  Test 5 | |
| Student Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Date: \_\_\_\_\_\_\_\_\_\_\_\_ | | |
| Special Instructions: Calculator Allowed  **1 page of A4 notes and Formula Sheet Allowed** | Time Allowed: 40 mins | | |
|  | Marks: / 45 | | |

**Question 1.** **[1, 1, 1, 1, 3: 7 marks]**

The price of a new washing machine is $2850. Lisa pays a deposit of 20% with the remainder to be paid over 2.5 years. The monthly repayments are $99.75.

Calculate:

a) the deposit

b) total amount borrowed

or $2850 - $570 = $2280

c) the total amount of repayments

399.75 = $2992.50

d) the total amount of interest paid

e) the flat rate interest for the monthly repayments

0.125

**Question 2. [1, 2, 2: 5 marks]**

Harry takes out a loan for $24 000 agreeing to repay $350 at the end of each monthly period, with a compound interest of 12% p.a. compounded monthly.

a) How much will he still owe on this loan after 5 years?

b) Suppose instead that Harry had made monthly repayments of $375.

i)How much would he still owe after 5 years in this case?

ii) How much would Harry save?

c) How long in years and months will it take for Harry to repay the loan in full:

i) if the monthly repayments were $350?

ii) if the monthly repayments were $375?

d) Find the amount of the monthly repayments that will be required for Harry to pay off the loan

in 8 years?

e) Write a recurrence relation to represent the loan over 8 years?

**Question 3. [5, 2, 2, 1: 10 marks]**

Belinda invests $500 for 8 years. The investment plans offered by the bank are:

* Plan 1: Simple Interest at 15% p.a.
* Plan 2: Compound Interest at 13.75%p.a. compounded annually.
* Plan 3: Compound Interest at 13.5% p.a. compounded quarterly.

a) Determine with reasons the best investment plan.

b) Calculate the effective yearly interest rate for Plan 3.

c) State the recursive formula for Plan 2.

d) Determine the value of Plan 2 after 4 years.

**Question 4. [1, 2, 2, 2, 2: 9 marks]**

To save money to travel overseas, Luke started an investment account. He used $1000 to open

the account and then deposited an extra $200 at the end of each month for two years.

The table below shows the following:

● The amount in the account at the beginning of each month (*An*)

● The interest added to the account each month (*In*)

● The deposit made near the end of each month (*Dn*)

● The amount in the account at the end of each month (*An + 1*).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Month (*n*)** | **Amount at**  **beginning of**  **month (*An*)** | **Calculation of**  **interest for month (*In*)** | **Deposit for**  **month (*Dn*)** | **Amount at**  **end of month**  **(*An+*1)** |
| 1 | $1000.00 | $1000.00 x 1.012 | $200.00 | $1212.00 |
| 2 | $1212.00 | $1212.00 x 1.012 | $200.00 | $1426.54 |
| 3 | $1426.54 | $1426.54 x 1.012 | $200.00 | $1643.66 |
| 4 | $1643.66 | $1643.66 x 1.012 | $200.00 | $1863.39 |
| 5 | $1863.39 | $1863.39 x 1.012 | $200.00 | $2085.75 |
| 6 | $2085.75 | $2085.75 x 1.012 | $200.00 | $2310.78 |

Note: The values in this table have been rounded to two decimal places.

a) What is the monthly interest rate?

b) Write a recursive rule to calculate the amount in the account at the end of each month.

c) How much is in the account after two years (rounded to nearest dollar)?

d) How much interest did Luke receive over the two-year period?

e) If Luke had been offered double the rate of interest but still opened his investment account with

$1000 and deposited $200 each month would the interest earned on his investment over the

two-year period have been:

A: twice as much

B: less than twice as much

C: more than twice as much.

State your choice and give a reason for your answer.

More than twice as much. For the first month the interest is doubled but after that the

basis for the calculation of interest is greater so more than twice as much interest is

earned each time.

Alternatively students may provide data for 1.2% $1056 is earned and for 2.4%

$2357.24 is earned and this is more than twice $1056 ($2112).

**Question 5. [2, 2: 4 marks]**

A car is initially valued at $65 000.

a) Determine its value at the end of the first five years using reducing balance depreciation

of 8.5% p.a.

|  |  |
| --- | --- |
| **Year** | **Value of Car** |
| **1** | **65000** |
| **2** | **59475** |
| **3** | **54419.63** |
| **4** | **49793.96** |
| **5** | **45561.47** |

b) Write a recurrence relation to calculate the value of the car at the end of each year.

**Question 6. [1, 2, 1: 4 marks]**

Upon retirement John switches his superannuation fund of $480 000 into an investment account paying 9% per annum compounded monthly. After three months, and every three months thereafter John wants the account to pay him $15 000, for as long as possible.

a) How many payments of $15 000 will this scheme allow John to receive?

57 payments

b) Write a recurrence relation to calculate the final payment?

c) What will be the final payment that John receives that closes the account?

**Question 7. [3 marks]**

Ava invests in a perpetuity account to provide her with a monthly payment of $2000. The interest rate for the investment is 4.95% p.a., compounding monthly.

Find the amount to the nearest thousand that Ava needs to invest in the perpetuity?

**Question 8. [3 marks]**

Daria borrowed $25 000 at 9% per annum reducing balance interest, and has to make payments of $245 per month.

a) Write a recurrence relation for the balance of the loan.

b) Find the time taken to pay off the loan in full.

c) Calculate the amount of the last payment.