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| AIC, MATHEMATICS LEARNING AREA**YEAR 12 MATHEMATICS APPLICATIONS – UNIT 4****Assessment Type: Response - 7%****TASK 8 - TEST 5 –** **Term 3, Week 3****CALCULATOR-ALLOWED****Syllabus Content:** 4..2.1 – 4.2.7Loans, Investment and Annuities |

Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ID: \_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_

**TIME ALLOWED -** Reading + Working time 50 minutes in class under test conditions

**MATERIAL REQUIRED FOR THIS PAPER**

*TO BE PROVIDED BY THE SUPERVISOR :* Question/answer booklet.

*TO BE PROVIDED BY THE CANDIDATE:*

*Standard Items:* pens, pencils, pencil sharpener, highlighter, eraser, ruler, drawing templates, Calculator

**IMPORTANT NOTE TO CANDIDATES**

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

**Structure of this paper**

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| --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be attempted | Suggested working time (minutes) | Marks available |
| **Calculator Assumed** | **7** | **7** | **50** | **50** |
|  | **Marks available:** | 50 |
| **Task Weighting** | 7%  |

**Instructions to candidates**

* The rules for the conduct of this examination are detailed in the booklet *WACE* *Examinations Handbook*. Sitting this examination implies that you agree to abide by these rules.
* Answer the questions in the spaces provided.
* Spare answer pages can be used. If you need to use them, indicate in the original answer space where the answer is continued.

**FORMULAS**

**Effective Interest Rate:**

ie =$\left[(1+ \frac{r}{n})^{n}-1\right]×100\%$

Note: r is rate of interest as a DECIMAL. n is number of compounding periods in a year.

**Simple Interest:**

SI =$\frac{P ×T×R}{100}$ 0r SI =$P×T×R$ if using R as a decimal

SI = Simple Interest

P = Principal Amount

T = Time in years

R = Rate of Interest

**Compound Interest:**

A =$P(1+ \frac{r}{n})^{n×T}$

Note: r is rate of interest as a DECIMAL. n is number of compounding periods in a year.

A = Final value of investment after interest is automatically added

P = Principal Amount

T = Time period of investment in years

r = Rate of Interest as a DECIMAL

n = number of compounding periods in a year

**Perpetuities:**

Perpetuity Amount = $Amount that is being invested ×Interest rate after compounding$

Note: For all of the above formulas, you can alternatively use the Financial menu on your ClassPad.

**Question One: [2, 2, 2, 2, 2] =10 marks**

1. Elaine borrows $25000 from a bank that pays nominal compound interest of 7.94% per annum, compounding fortnightly.

Calculate the effective interest rate (%) for the above loan (to two decimal places)

1. Peter invests $15000 in an account that earns an interest of 4.6% interest per annum. Which compounding period would be best for Peter?

Weekly or Monthly or Fortnightly or Yearly. Explain why you chose your answer.

1. Jacob is considering a loan of $35000 from his bank which charges an interest of 8.2% per annum. Which compounding period would be better for Jacob:

Fortnightly or Monthly or Quarterly or Yearly. Explain why you chose your answer.

1. Some of these terms are related to each other and can be categorised into two distinct groups. Place the terms in the correct group.

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| --- | --- |
| **Group 1** | **Group 2** |
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Arithmetic Sequence Compound Interest Linear Model

Simple Interest Constant Ratio Vn+1 = 0.85Vn Constant Difference

Geometric Sequence Exponential Model Vn+1 = Vn – b

1. A farm machinery costing $40,000 is depreciating at the rate of 6% per year. Write the recursive rule that will give the value of the machinery after ‘n’ years.

Tn+1 =

**Question Two: [1, 4, 7, 1, 1, 2] = 16 marks**

Syazia needs to purchase a car. She finds a reducible interest loan from a bank at a rate of 7.75% per annum compounded fortnightly. The fortnightly repayments are $300. A partial spreadsheet is shown below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fortnight** | **Opening Balance ($)** | **Interest paid ($)** | **Repayments ($)** | **Closing Balance ($)** |
| 1 | 10500 | 31.30 | 300 | 10231.30 |
| 2 | 10231.30 | **A** | 300 | **B** |
| 3 | **C** | 29.69 | 300 | 9691.49 |
| 4 | 9691.49 | 28.89 | 300 | 9420.38 |
| 5 | 9420.38 | 28.08 | 300 | 9148.46 |
| 6 | 9148.46 | 27.27 | 300 | 8875.73 |
| “ | “ | “ | “ | “ |
| 36 | **D** | **E** | 300 | 304.67 |
| 37 | 304.67 | 0.91 | 300 | 5.57 |
| 38 | 5.57 | **F** | **G** | 0.00 |

1. What loan amount did Syazia borrow from the bank?
2. The recursive formula for this loan that will give the amount at the end of each fortnight can be written as:

Tn+1 = [1 +$\frac{a}{ b}$] An – c T0 = d

Write down the values of a, b, c, and d.

a = b = c = d =

Hence rewrite the rule with the answers obtained above. There is no need to evaluate the fraction $\frac{a}{ b}$. Leave it as a fraction.

 Tn+1 = T0 =

1. Determine the table entries labelled A to G
2. What is the amount of the final repayment?
3. How much is owing on this reducible interest loan after the first year?
4. Calculate the total amount of interest Syazia will be required to pay on this reducible interest loan.

**Question Three: [3, 1] = 4 marks**

Magda invests $40 000 in an annuity paying interest at the rate of 6% per annum, compounding quarterly. She receives a payment of $10 380 each quarter for one year. This loan can be modelled using the recurrence relation:

Vn+1 = RVn – D V0 =

Vn is the balance of the loan after n payments have been received.

1. State the values of R, D and V*0*
2. Determine the balance of the annuity after six months?

**Question Four: [2, 1, 3, 4 mark each] = 10 marks**

|  |  |
| --- | --- |
| N |  |
| I% |  |
| PV |  |
| PMT |  |
| FV |  |
| P/Y |  |
| C/Y |  |

Fareed borrowed $250000 at a rate of 7.8% per annum compounded monthly. He makes monthly repayments of $2060.09 to repay the loan.

1. How long will it take Fareed to repay the loan?

*(If using Financial Menu, show all entries in the table on the right. If using Sequence Menu write the recursive rule to show how you got the answer)*

1. How much of the loan has been repaid by the end of 4 years?

After 4 years, Fareed increases his monthly repayments to $2250.

1. Calculate by how many months the length of the loan is reduced by this increase in repayments. You may round to the nearest month.
2. How much will Fareed save on this loan by increasing his repayments to $2250 after 4 years.

**Question Five: [3, 1] = 4 marks**

Najma received an inheritance of $642000 and invested the amount in a **perpetuity** that pays 6.1% per annum, compounding quarterly.

1. What is the perpetuity amount that Najma receives quarterly?
2. After five quarterly payments to Najma, how much money remains of the investment?

**Question Six : [2, 1, 2, 1] = 6 marks**

Khalid borrows $50,000 to refurbish his apartment. At the end of each month interest is added to the outstanding balance and then a repayment is made. Khalid has agreed to repay the loan in full by making equal monthly repayments of $609.29 for 10 years.

1. Determine correct to one decimal place the annual compounding rate of interest
2. Calculate the amount Khalid owes after the first year.
3. How much interest will Khalid pay on this loan?
4. When does the amount Khalid owes first fall below $25000?

**END OF TEST**

**WORKING OUT PAGE.**

**You may use the financial template to show your working.**

**Clearly write the Question number.**

**Question No.**

|  |  |
| --- | --- |
| N |  |
| I% |  |
| PV |  |
| PMT |  |
| FV |  |
| P/Y |  |
| C/Y |  |

**Question No.**

|  |  |
| --- | --- |
| N |  |
| I% |  |
| PV |  |
| PMT |  |
| FV |  |
| P/Y |  |
| C/Y |  |

**Question No.**

|  |  |
| --- | --- |
| N |  |
| I% |  |
| PV |  |
| PMT |  |
| FV |  |
| P/Y |  |
| C/Y |  |

**Question No.**

|  |  |
| --- | --- |
| N |  |
| I% |  |
| PV |  |
| PMT |  |
| FV |  |
| P/Y |  |
| C/Y |  |

**EXTRA PAGE FOR WORKING**