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Financial Maths

Saving for future studies

In this lesson Tebogo explores ways to pay for his tertiary studies. He decides to save some of the money he earns from his part time job, each month. He hopes to have enough to pay for his fees.. He uses a table to calculate the interest earned for each of his deposits and finally calculates the total amount he will save.

Lesson Outcomes

By the end of this lesson, you should be able to:

- Apply knowledge of geometric series to solve future value annuity problems.
- Solve future value annuity problems by using the future value annuity formula.

Curriculum Links

LO 1: Number and Number Relationships

12.1.4 (b) Apply the knowledge of geometric series to solving annuity, bond repayments and sinking fund problems, with or without the use of the formulae

Lesson Notes

Tebogo makes a monthly investment of R700,00 in an annuity which pays 9,5% interest compounded monthly.

Terms you need to know:

An Annuity is an investment in which a fixed amount of money is invested at regular time intervals.

Compound interest is when interest is calculated on the balance in an account at the end of each period. We can calculate the compound interest using the formula

$$A = P(1+i)^n$$

A – accumulated amount

P – principal amount

i – interest

n – number of calculations

For Tebogo's annuity, the interest rate was given as 9,5% per annum. This means the interest rate is quoted for a year. But the calculation of the interest rate is done each month. Notice the time periods are different. To do the monthly interest rate calculation we must convert the annual rate by dividing 9,5% by 12 months.

How much interest does the R700,00 Tebogo invested on the 1st May earn each month till the 1st of February?

Number of Months	Date	Value of single	Interest (9,5% p.a)	Value at end of month
1st	1 Jun	R700,00	R 5,54	R 705,54
2nd	1 Jul	R705,54		
3rd	1 Aug			
4th	1 Sep			
5th	1 Oct			
6th	1 Nov			
7th	1 Dec			
8th	1 Jan			
9th	1 Feb			



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The next R700 he invests on the 1st June will also earn interest but will only be invested for eight months and so earns less interest. Can you use the table above to work out the interest earned for each R700 he invests? Tebogo finds that the total balance of his investment by adding the monthly totals together. The monthly totals form a geometric series with a common ratio of

$$\left(1 + \frac{0,095}{12}\right)$$

Tebogo calculates the total value of the investment by finding the sum of the geometric series using the equation:

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

He finds that he gets the same answer when he uses the future value formula:

$$F = \frac{x[(1+i)^n - 1]}{i}$$

F : future value

x : amount invested at regular intervals

i : interest

n : number of deposits made

Task

Calculate how much money Tebogo has to put away each month in order for him to have enough money to pay his first year's fees of R10 000 in February next year in an annuity that earns 9,5% interest per annum compounded monthly. Hint: Use the formula:

$$x = \frac{Fi}{[(1+i)^n - 1]}$$