Pg1

Monday, 09 May 2022 11:54

Sandile bought a car for R180 000. The value of the car depreciated at 15% per annum according to the reducing-balance method. The book value of Sandile's car is currently R79 866,96.

6.1.1 How many years ago did Sandile buy the car?

6.1.2 At exactly the same time that Sandile bought the car, Anil deposited R49 000 into a savings account at an interest rate of 10% p.a. compounded quarterly. Has Anil accumulated enough money in his savings account to buy Sandile's car now?

6.1.1) $A = P(1-i)^n$

$$79\ 866,96 = 180\ 000(1-0.15)^n$$

$$\frac{79\ 866,96}{180\ 000} = (1-0.15)^n$$

$$\log\left(\frac{79\ 866,96}{180\ 000}\right) = n\log(1-0,15)$$

$$n = \frac{\log\left(\frac{79\ 866,96}{180\ 000}\right)}{\log(1-0,15)}$$

$$\boxed{n = 5 \text{ years}}$$

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

$$A = 49\ 000\left(1+\frac{0.1}{4}\right)^{4\times 5}$$

$$A = R80\ 292,21$$

Yes, they can afford the car!

Exactly 10 months ago, a bank granted Jane a loan of R800 000 at an interest rate of 10,25% p.a., compounded monthly.
The bank stipulated that the loan:

- Must be repaid over 20 years
- Must be repaid by means of monthly repayments of R7 853,15, starting one month after the loan was granted

6.2.1 How much did Jane owe immediately after making her 6th repayment?

6.2.2 Due to financial difficulties, Jane missed the 7th, 8th and 9th payments. She was able to make payments from the end of the 10th month onwards. Calculate Jane's increased monthly payment in order to settle the loan in the original 20 years.

3 payments

20 years × 12 − 6

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

$$P = \frac{7853{,}15\left(1-\left(1+\frac{0.1025}{12}\right)^{-234}\right)}{\frac{0.1025}{12}}$$

$$\boxed{P = R793\ 749{,}25}$$

7th, 8th and 9th missed payment

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

$$= 793\ 749{,}25\left(1+\frac{0.1025}{12}\right)^3$$

$$= R814\ 263{,}3052$$

Find the new payments

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

20 years × 12 − 9

$$814\ 263{,}3052 = \frac{x\left[1-\left(1+\frac{0.1025}{12}\right)^{-231}\right]}{\frac{0.1025}{12}}$$

$$\boxed{x = R8\ 089{,}20}$$

Pg3

Monday, 09 May 2022 12:24

7.1 An amount of R10 000 was invested for 4 years, earning interest at r% p.a., compounded quarterly. At the end of the 4 years, the total amount in the account was R13 080. Determine the value of r.

?

7.2 A businesswoman deposited R9 000 into an account at the end of January 2014. She continued to make monthly deposits of R9 000 at the end of each month up to the end of December 2018. The account earned interest at a rate of 7,5% p.a., compounded monthly.

7.2.1 Calculate how much money was in the account immediately after 60 deposits had been made.

7.2.2 The businesswoman left the amount calculated in QUESTION 7.2.1 for a further n months in the account. The interest rate remained unchanged and no further payments were made. The total interest earned over the entire investment period was R190 214,14. Determine the value of n.

added on value

number of time this gets compounded

7.1) $13\,080 = 10\,000\left(1+\frac{i}{4}\right)^{16}$

$\frac{13\,080}{10\,000} = \left(1+\frac{i}{4}\right)^{16}$

$\left(1+\frac{i}{4}\right) = \left(\frac{13\,080}{10\,000}\right)^{\frac{1}{16}} = \cancel{\sqrt[16]{\frac{13\,080}{10\,000}}}$

$\frac{i}{4} = \left(\frac{13\,080}{10\,000}\right)^{\frac{1}{16}} - 1$

$i = 4\left[\left(\frac{13\,080}{10\,000}\right)^{\frac{1}{16}} - 1\right]$

save calculator for the very end

$i = 0.06764$

$i = 6{,}77\%$

$\boxed{r = 6{,}77\%}$

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

$F = \frac{9000\left[\left(1+\frac{0.075}{12}\right)^{60} - 1\right]}{\frac{0.075}{12}}$

$\boxed{F = R652\,743{,}95}$

7.2.2) $60 \times R9000 = R540\,000$

NO Interest

from monthly payments

only interest

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

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

only interest, payments

$$652\,743{,}95\left(1+\frac{0.075}{12}\right)^n = \underbrace{190\,214{,}14}_{\text{only interest}} + \underbrace{540\,000}_{\text{payments}}$$

$$730\,214{,}14 = 652\,743{,}95\left(1+\frac{0.075}{12}\right)^n$$

$$\frac{730\,214{,}14}{652\,743{,}95} = \left(1+\frac{0.075}{12}\right)^n$$

$$\log\left(\frac{730\,214{,}14}{652\,743{,}95}\right) = n\log\left(1+\frac{0.075}{12}\right)$$

$$n = \frac{\log\left(\frac{730\,214{,}14}{652\,743{,}95}\right)}{\log\left(1+\frac{0.075}{12}\right)}$$

$$\boxed{n = 18 \text{ months}}$$

6.1 Calculate how many years it will take for the value of a truck to decrease to 50% of its original value if depreciation is calculated at 15% per annum using the reducing-balance method.

6.2 Every month Tshepo deposited R1 500 for his retirement into an account that paid interest at a rate of 9,2% per annum, compounded monthly. Tshepo made his first instalment on his 23rd birthday and the last instalment one month before his 55th birthday. Calculate how much money he had in the account on his 55th birthday.

6.3 Abram has R150 000 to invest in two separate accounts. One account pays interest at a rate of 8,4% per annum, compounded quarterly, and the other account at a rate of 9,6% per annum, compounded monthly. How much money should he invest in each account so that he will collect the same amount from each account at the end of 12 years?

6.1) $A = P(1-i)^n$

$\frac{1}{2}\cancel{P} = \cancel{P}(1-0.15)^n$

$\log\left(\frac{1}{2}\right) = n\log(1-0.15)$

$n = \dfrac{\log\left(\frac{1}{2}\right)}{\log(1-0.15)} \approx 4.27$ years

6.2) $F = \dfrac{x\left[(1+i)^n - 1\right]}{i}$ $(55-23)\times 12$

$= \dfrac{1500\left[\left(1+\frac{0.092}{12}\right)^{384} - 1\right]}{\frac{0.092}{12}}$

$\boxed{= R3\ 478\ 620,49}$

Note: Add the last month of interest gained

$A = 3\ 478\ 620,49\left(1+\frac{0.092}{12}\right)^1$

$\boxed{A = R3\ 505\ 289,91}$

6.3) Let A be the amount invested at 8,4% p.a compounded quarterly

Let B be the amount invested at 9,6% p.a compounded monthly

$A + B = 150\ 000$

$\boxed{A} = 150\ 000 - B$

$(150\ 000 - B)\left(1+\frac{0.084}{4}\right)^{48} = B\left(1+\frac{0.096}{12}\right)^{144}$

$$(150\,000 - B)\left(1+\frac{0.084}{4}\right)^{48} = B\left(1+\frac{0.096}{12}\right)$$

$$150\,000\left(1+\frac{0.084}{4}\right)^{48} - B\left(1+\frac{0.084}{4}\right)^{48} = B\left(1+\frac{0.096}{12}\right)^{144}$$

$$B\left[\left(1+\frac{0.084}{4}\right)^{48} + \left(1+\frac{0.096}{12}\right)^{144}\right] = 150\,000\left(1+\frac{0.084}{4}\right)^{48}$$

$$\boxed{B = R69\ 390{,}95}$$

$$A = 150\,000 - 69\ 390{,}95$$

$$\boxed{A = R80\ 609{,}05}$$