



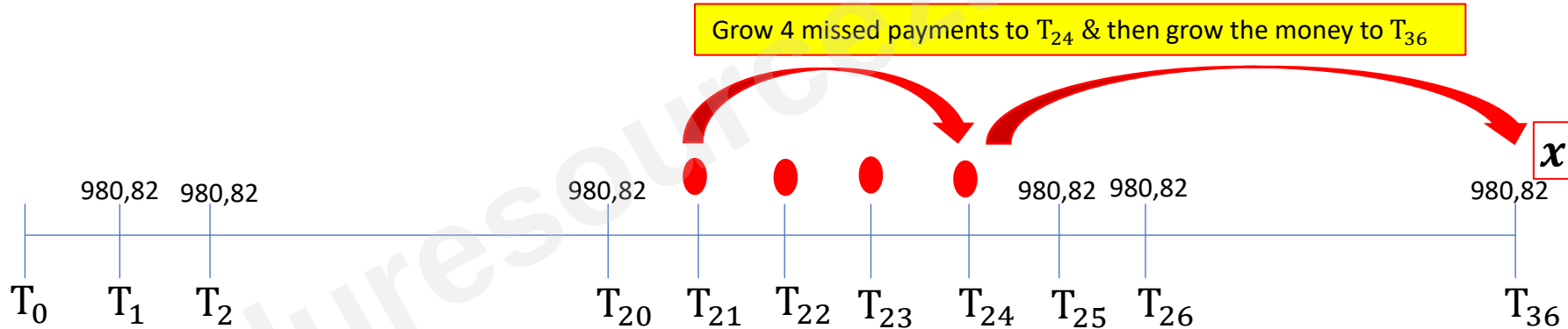
FINANCIAL MATHS

MISSED PAYMENTS,
EXTRA PAYMENTS
& WITHDRAWALS

EXAMPLE 1

A loan of R25 000 is amortised over a period of 3 years by means of monthly payments of R980.82, at an interest rate of 24% per annum compounded monthly. The payments are missed for four months, from the 21st to the 24th month.

- a) The borrower decides to pay an additional amount with the final payment. Calculate this amount.
- ★ b) On second thought, he decides rather to increase his monthly repayments from the 25th month onwards. Calculate what these new payments will be.
- c) Suppose that no payments are missed in the loan in example 1. However, suppose that the borrower decides to pay an additional amount of R4000 with the 20th payment. Calculate what his reduced monthly instalment will be from T₂₁ onwards.

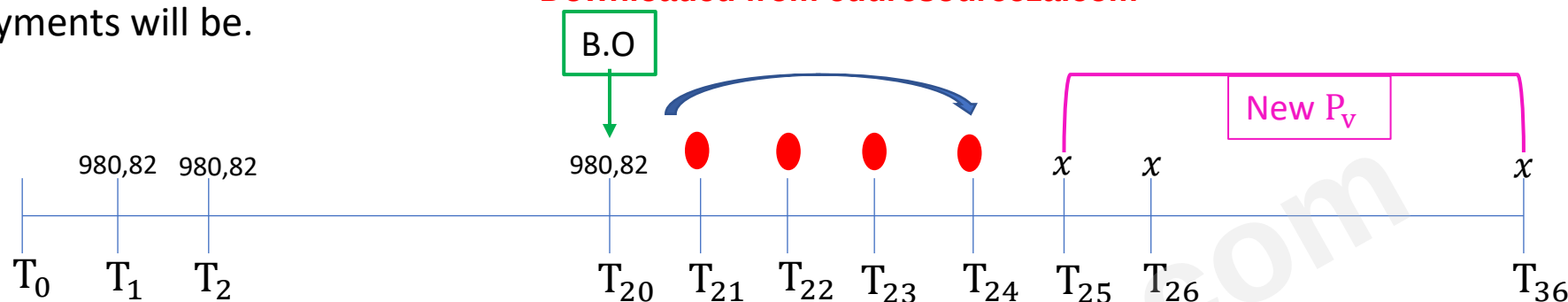


$x = \text{future value of the 4 missed payments} \times \text{compound interest to the end}$

$$= \frac{980,82 \left[\left(1 + \frac{24\%}{12} \right)^4 - 1 \right]}{\frac{24\%}{12}} \times \left(1 + \frac{24\%}{12} \right)^{12}$$

$$= R \ 5 \ 126,94$$

★ b) On second thought, he decides rather to increase his monthly repayments from the 25th month onwards. Calculate what these new payments will be.



1. Calculate the B.O. immediately after the last payment.
2. Apply compound interest to this outstanding balance, till one period before payments resume.
3. A new present value annuity will resume.

$$\begin{aligned}
 \text{B.O.} &= P(1+i)^k - \frac{x[(1+i)^k - 1]}{i} \\
 &= 25\,000(1+0.02)^{20} - \frac{980,82[(1.02)^{20} - 1]}{0,02} \\
 &= R13\,317,33865
 \end{aligned}$$

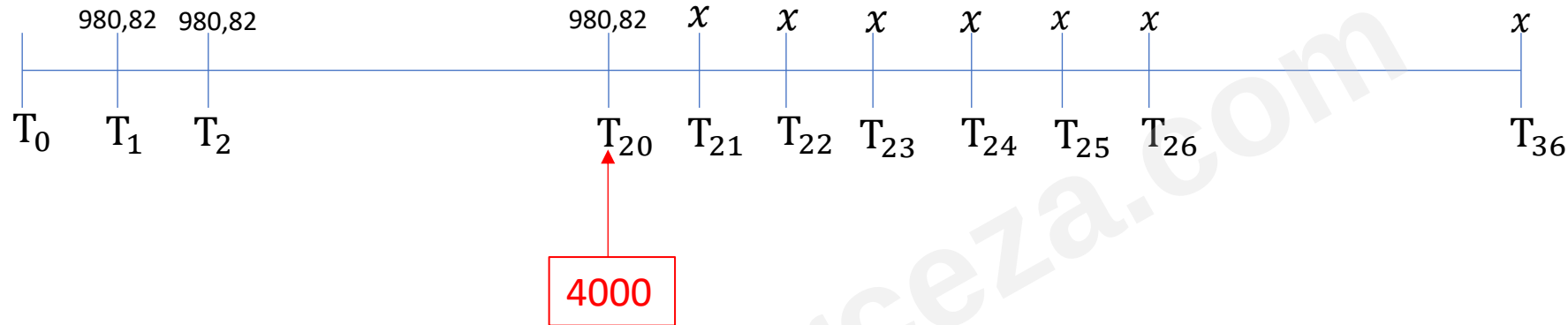
$$\begin{aligned}
 A &= P(1+i)^n \\
 &= 13\,317,33865(1,02)^4 \\
 &= R\,14\,415,12
 \end{aligned}$$

$$\begin{aligned}
 P &= \frac{x[1-(1+i)^{-n}]}{i} \\
 14\,415,12 &= \frac{x[1-(1,02)^{-12}]}{0,02}
 \end{aligned}$$

$$\frac{14\,415,12 \times 0,02}{[1-(1,02)^{-12}]} = x$$

$$\therefore x = R\,1\,363,09$$

c) Suppose that no payments are missed in the loan in example 1. However, suppose that the borrower decides to pay an additional amount of R4000 with the 20th payment. Calculate what his reduced monthly instalment will be from T_{21} onwards.



$$\text{B. O at } T_{20} = 25\,000(1 + 0.02)^{20} - \frac{980,82[(1.02)^{20} - 1]}{0,02} - 4000 \longrightarrow$$

$$= R\,9\,317,34$$

R4000 is subtracted from the B.O because this amount is paid into the loan, reducing the loan amount.

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

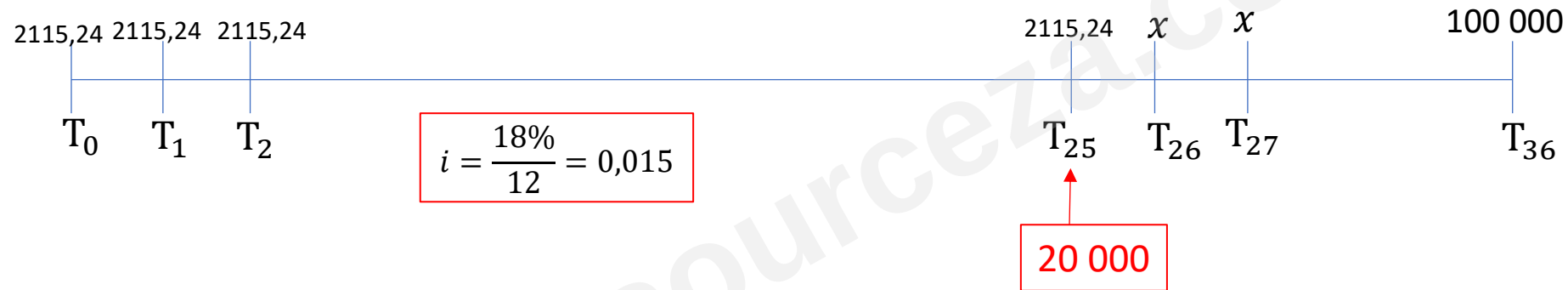
$$9\,317,34 = \frac{x[1 - (1.02)^{-16}]}{0,02}$$

$$\frac{9317,34 \times 0,02}{[1 - (1.02)^{-16}]} = x$$

$$x = R\,686,22$$

Example 2:

An investor opens a savings account and pays an initial deposit of R2115.24. The account is opened at the beginning of the first month. At the end of the month, continuing for 3 years from the opening of the account, he pays a monthly amount of R2115.24. Interest is 18% per annum compounded monthly. He wishes to receive a lump sum of R100 000 at the end of the three year period. Due to financial difficulty, he withdraws R20 000 after the 25th month. What will his revised monthly payments be, from the 26th month onwards, so that he will still receive R100 000 after 3 years?



1. First calculate the future value of the amount at T_{25} , subtract the 20 000,
2. THEN GROW THE POTENTIAL INTEREST THAT IS NOW LOST TO THE END
3. The amount now needed is the 100 000 – no.1 calculation.
4. Now create a new future value calculation.

$$\begin{aligned} 1. \quad F &= \frac{x[(1+i)^n - 1]}{i} - 20000 \\ &= \frac{2115,24[(1,015)^{26} - 1]}{0,015} - 20\,000 \\ &= R46\,659,60771 \end{aligned}$$

$$\begin{aligned} 2. \quad A &= P(1+i)^n \\ &= 46\,659,60771(1,015)^{11} \\ &= R\,54962,63532 \end{aligned}$$

3. Now needed:

$$100\,000 - 54\,962,63532 = R\,45\,037,36468$$

$$4. \quad F = \frac{x[(1+i)^n - 1]}{i}$$
$$45\,037,36468 = \frac{x[(1,015)^{11} - 1]}{0,015}$$
$$\frac{45\,037,36468 \times 0,015}{[(1,015)^{11} - 1]} = x$$

$$\therefore x = R\,3\,796,37$$



Homework:

Exercise 6 page 293

d) e) f)

Consolidation Exercise:

a) To g)

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