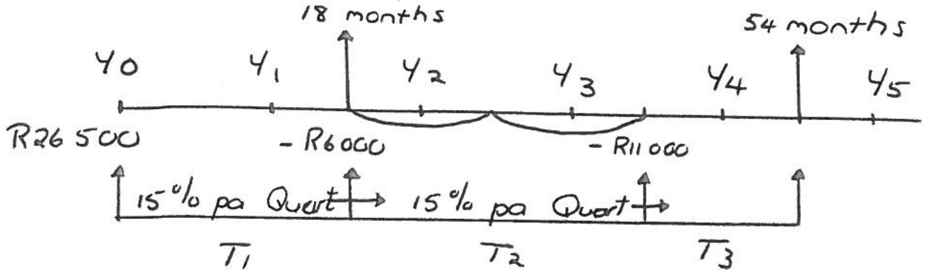
Worksheet 2015-12EG-00007(1)

Financial Mathematics Grade 11 Revision – Time frames

(1) Rusty applies for a loan of R26 500 and agrees to repay the total outstanding amount, in 54 months' time. The interest on the loan is calculated quarterly at 15% pa. Rusty receives his bonus after 18 months and decides to repay R6 000 of his loan. After a further two years Rusty repay another R11 000 of his loan. Calculate the total outstanding amount of the loan that Rusty owes after the 54 months.



Method 1:

T_1: $n = 1\frac{1}{2}$ years

$i = 0{,}15$

$m = 4$

$A = P\left(1 + \frac{i^{(m)}}{m}\right)^{m \times n}$

$= 26\,500\left(1 + \frac{0{,}15}{4}\right)^{4 \times 1{,}5}$

$A = R33\,050{,}23\ldots$

T_2: $n = 2$ years

$i = 0{,}15$

$m = 4$

$A = (33\,050{,}23\ldots - 6\,000) \times \left(1 + \frac{0{,}15}{4}\right)^{4 \times 2}$

$A = R36\,314{,}14\ldots$

T_3: $n = 1$ years

$i = 0{,}15$

$m = 4$

$A = (36\,314{,}14\ldots - 11\,000) \times \left(1 + \frac{0{,}15}{4}\right)^{4 \times 1}$

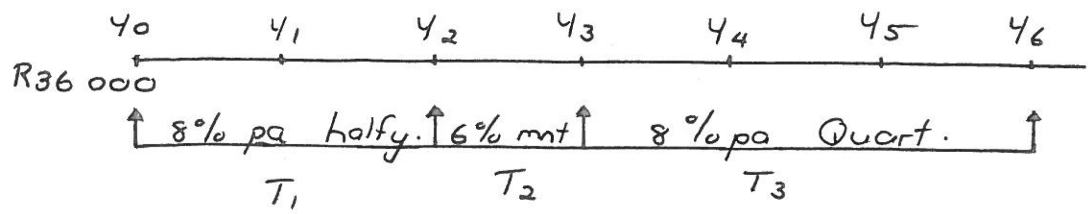
$= R29\,330{,}25$

Method 2:

$A = \left\{\left[26\,500\left(1 + \frac{0{,}15}{4}\right)^{6} - 6000\right] \times \left(1 + \frac{0{,}15}{4}\right)^{8} - 11\,000\right\} \times \left(1 + \frac{0{,}15}{4}\right)^{4}$

$= R29\,330{,}25$

(2) R36 000 is invested for 6 years. The interest rate for the first two years is 8% pa semi-annually compounded. After two years the interest rate changes to 6% pa monthly compounded for the next year. For the last three years, the interest rate changes once again is 8% pa quarterly compounded. Calculate the accumulated amount after the 6 years.



Method 1:

T_1: $n = 2$ years $A = 36000\left(1 + \frac{0,08}{2}\right)^{2\times 2}$

$m = 2$ $A = R42\ 114,908...$

$i = 0,08$

T_2: $n = 1$ $A = 42\ 114,908...\left(1 + \frac{0,06}{12}\right)^{1\times 12}$

$m = 12$ $A = R44\ 712,46...$

$i = 0,06$

T_3: $n = 3$ $A = 44\ 712,46...\left(1 + \frac{0,08}{4}\right)^{3\times 4}$

$m = 4$ $A = R56\ 706,22$

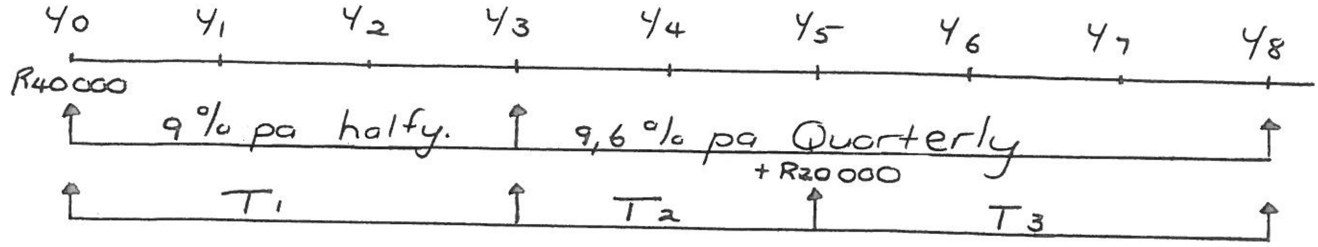
$i = 0,08$

Method 2:

$$A = \left[36\ 000\left(1 + \frac{0,08}{2}\right)^4\right] \times \left(1 + \frac{0,06}{12}\right)^{12} \times \left(1 + \frac{0,08}{4}\right)^{12}$$

$= R56\ 706,22$

(3) André invests R40 000 in the money market for 5 years. After five years he decides to invest the total earnings as well as another R20 000 for a further three years. For the first 3 years the interest rate is fixed at 9% pa half yearly compounded after which the interest rate changes to 9,6% pa quarterly compounded for the rest of the period. Calculate the total earnings for André after 8 years.



Method 1:

T_1: $n = 3$ $\quad A = 40\,000\left(1+\frac{0{,}09}{2}\right)^{2\times3}$

$m = 2$ $\quad A = R52\,090{,}404\ldots$

$i = 0{,}09$

T_2: $n = 2$ $\quad A = 52\,090{,}404\ldots\left(1+\frac{0{,}096}{4}\right)^{2\times4}$

$m = 4$ $\quad A = R62\,973{,}435\ldots$

$i = 0{,}096$

T_3: $n = 3$ $\quad A = 82\,973{,}435\ldots\left(1+\frac{0{,}096}{4}\right)^{3\times4}$

$m = 4$ $\quad A = R110\,290{,}61$

$i = 0{,}096$

Method 2:

$A = \left\{\left[40\,000\left(1+\frac{0{,}09}{2}\right)^6\right]\times\left(1+\frac{0{,}096}{4}\right)^8 + 20\,000\right\}\times\left(1+\frac{0{,}096}{4}\right)^{12}$

$A = R110\,290{,}61$