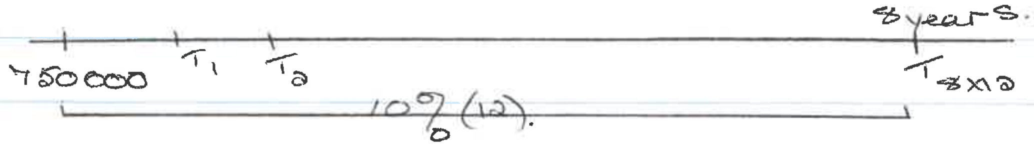
AP Grade 12 Prelim P2 2019.

Question 1



$A = \frac{0,10}{12.}$

(a) Interest for 1 month $= \frac{0,10}{12} \times 750\ 000.$

$= R6250.$

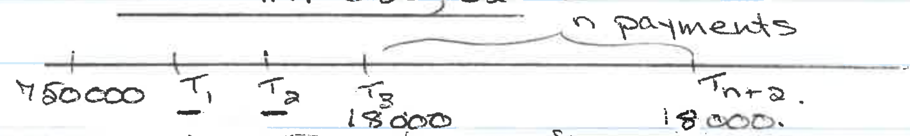
R6000 is not even going to cover the interest on the loan.
He will never pay off the loan. (3)

(b) $750\ 000(1+A)^{8\times12} = x\left\{\frac{(1+A)^{8\times12}-1}{A.}\right\}$ $A = \frac{0,1}{12.}$

$1663631,72 = x\{146,181...\}$

$\underline{x = R11\ 380,62}$ (6)

(c) (i)



$A = \frac{0,1}{12.}$

$750\ 000(1+A)^{n+2} = 18\ 000\left\{\frac{(1+A)^n-1}{A.}\right\}$ OR. $750\ 000\ (1+A)^n = 18000 \times \left\{\frac{(1+A)^{n-2}-1}{A.}\right\}$

$(1+A)^{2}.\ 750\ 000 = 18000\left\{\frac{1-(1+A)^{-n}}{A}\right\}$

$\frac{750\ 000}{18000.}(1+A)^2.A. = 1-(1+A)^{-n}$

(B)
$0,6469... = (1+A)^{-n}.$

$-n = \log_{(1+A).} 0,6469$

$n = 52,4726....$ (9)

$\therefore$ 52 payments of R18000 + 1 final payment of less.

e (ii)

T_0	T_1	T_2	T_3	…	T_{54}	T_{55}
750 000	–	–	18000.		18000	F.

$$\underbrace{T_3 \ldots T_{54}}_{\text{52 payments}}$$

$$750\,000(1+A)^{55} = 18000\left\{\frac{(1+A)^{52}-1}{A}\right\}(1+A) + F.$$

$$\overset{C}{1183826{,}61} - \overset{D}{1175299{,}45} = F$$

$$F = 8527{,}16.$$

(7)

Question 2.

a) $F = P(1-i)^n$ sub.

$= 600\,000(1-0{,}3)^4$

$= 144\,060.$ (3)

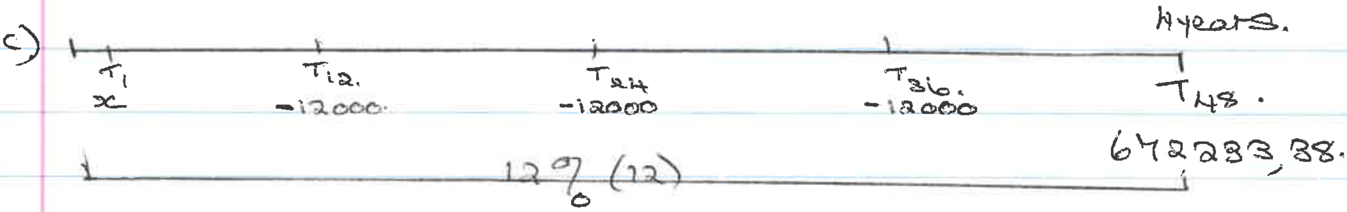
b) $F = P(1+0{,}08)^4$ sub.

$= 600\,000(1+0{,}08)^4$

$= 816\,293{,}38.$

Sinking fund $816\,293{,}38 - 144\,060.$

$= 64\,2233{,}38.$ (5)

c) 

$A = \frac{0{,}12}{12}$

$642233{,}38 = x\left\{\frac{(1+A)^{4\times 12}-1}{A}\right\} - 12000(1+A)^{36} - 12000(1+A)^{24} - 12000(1+A)^{12}$

$642233{,}38 + 12000(1+A)^{36} + 12000(1+A)^{24} + 12000(1+A)^{12} = x\left\{\frac{(1+A)^{48}-1}{A.}\right\}$

B

$718161{,}32. = x\{61{,}222\ldots\ldots\}.$

$x = 11730{,}33$ (14).

OR. $1+D = \left(1+\frac{0{,}12}{12}\right)^{12}$ Calculate effective int. $A = \frac{0{,}12}{12.}$

$D = 0{,}126825\ldots\ldots$

$642233{,}38 + 12000\left\{\frac{(1+D)^3-1}{D}\right\}(1+D) = x\left\{\frac{(1+A)^{48}-1}{A}\right\}$

(B) $718161{,}32 = x\{61{,}222\ldots\}^c$

$x = 11\,730{,}33.$

Question 3.

2014   6,09% p.a.   end of 2014.

2015   4,58% p.a.

2016   6,34% p.a.

2017   5,27% p.a

2018   4,62% p.a.

2019.   4,96% pa.

$800(1+0,0609)(1+0,0458)(1+0,0634)(1+0,0527)(1+0,0462)$

$= 1039,51095$ (6)

$800(1+i) = 1039,51.$

$i = 0,2993.$

over the 5 years from 2014 to 2018 % price increase was 29,93%.   (3)

Average rate of inflation from 2014-2018.

$800(1+i)^5 = 1039,510595.$

$(1+i)^5 = \frac{1039,51}{800}.$

$i = \sqrt[5]{\frac{1039,51}{800}} - 1$

$i = 0,0537748$

Av. inflation 2014-2018   5,344% p.a.   (6)

not 5,38% p.a.

$(1,0609)(1,0458)(1,0634)(1,0527)(1,0462) = (1+i)^5$

$\sqrt[5]{1,299388688.} - 1 = i$

$i = 0,05377448.$

$i = 5,37748\%.$ (6)

Question 3.

2014.	6,09%	Start of 2014.
2015	4,58%	
2016	6,34%.	
2017	5,27%.	
2018	4,62%.	
2019.	4,96%.	

$800 \times (1+0{,}0458)(1+0{,}0634)(1+0{,}0527)(1+0{,}0462)(1+0{,}0496)$
$= 1028{,}44.$ ✓ (6)

$800(1+i) = 1028{,}44.$

$i = 0{,}2855$ ✓ (3)

over 5 years the percentage increase is 28,55%

Average Rate of inflation

$800(1+i)^5 = 1028{,}44.$ ✓

$1+i = \sqrt[5]{\frac{1028{,}44}{800}}$ ✓

$i = 0{,}05152$ ✓

$5{,}15\%$ p.a. ✓ (6)

Question 4

a) $T_{n+1} = aT_n + bT_{n-1}$

$T_3 = 2{,}25 = aT_2 + bT_1$

$2{,}25 = a(2) + b(-1{,}5)$ $\qquad 2a - 1{,}5b = 2{,}25$

$T_4 = aT_3 + bT_2$

$7{,}125 = a(2{,}25) + b2$ $\qquad 2{,}25a + 2b = 7{,}125$

$a = x = \frac{243}{118} = 2{,}0593$

$b = y = \frac{147}{118} = 1{,}2457$

(8)

b)

decreasing
discrete
exponential
y-int, and no x-int

(4)

c) $P_{n+1} = 54 + r \cdot 54\left(1 - \frac{54}{120}\right) = 54 + 29{,}7r$ 3

$P_{n+2} = P_{n+1} + r \cdot P_{n+1}\left(1 - \frac{P_{n+1}}{120}\right)$ 1

$70 = (54 + 29{,}7r) + r(54 + 29{,}7r)\left(1 - \frac{54 + 29{,}7r}{120}\right)$

$r = 0{,}27$ ('solve' function)

(9)

set initial guess at 1.

QUESTION 5

5.1 1 / 0,083 = **12 years** (2)

5.2 $\frac{b.f.L.W}{b.L.W} = \frac{0,000\ 000\ 169}{0,000\ 655} = \mathbf{0,000\ 258}$ (4)

5.3 0,345 = 1 × 1 × 0,6 × female **females = 57,5%** (4)

5.4 $W_{n+1} = W_n + 0,345.W_n\left(1 - \frac{W_n}{25\ 000}\right) - 0,000\ 655.W_n.L_n$ where $W_{n+1} = W_n$

$0,345.W_n\left(1 - \frac{W_n}{25\ 000}\right) = 0,000\ 655.W_n.L_n$

$L_n = \frac{0,345.\left(1 - \frac{5\ 500}{25\ 000}\right)}{0,000\ 655}$ **L_n = 410,8 ≈ 410 or 411** (8)

[18]