

NATIONAL SENIOR CERTIFICATE

PUSH – ONE INTERVENTION PROGRAM

MATHEMATICS

GRADE 12

LAST PUSH

2022

FINANCIAL MATHEMATICS MEMORANDUM
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FINANCIAL MATHEMATICS FORMULAE

DESCRIPTION	FORMULA
SIMPLE INTEREST (STRAIGHT LINE METHOD)	$A = P(1 + in)$
INTEREST EARNED ON SIMPLE INTEREST	$SI = A - P$
SIMPLE DEPRECIATION (STRAIGHT LINE METHOD)	$A = P(1 - in)$
COMPOUND INTEREST	$A = P(1 + i)^n$
INTEREST EARNED ON COMPOUND INTEREST	$CI = A - P$
COMPOUND DEPRECIATION (REDUCING BALANCE METHOD)	$A = P(1 - i)^n$
NORMAL AND EFFECTIVE INTEREST RATES	$1 + i_{eff} = \left(1 + \frac{i_{nom}}{m}\right)^m$
FUTURE VALUE	$F = \frac{x[(1 + i)^n - 1]}{i}$
SINKING FUND - CP: cost price - SV: scrap value	$Sinking\ fund = CP - SV$
INTEREST EARNED ON FUTURE VALUE	$Interest\ earned = F - (x \times n)$
PRESENT VALUE	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$
INTEREST PAID ON PRESENT VALUE	$Interest\ paid = (x \times n) - P$
OUTSTANDING BALANCE ON PRESENT VALUE	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ n = payments still to be made $OB = P(1 + i)^n - \frac{x[(1 + i)^n - 1]}{i}$ n = payments already made
FINAL PAYMENT ON PRESENT VALUE	$FP = OB(1 + i)^1$

TUTORIAL 1

Activity 1

	$A = P(1 + i)^n$ $120\,000 = P \left(1 + \frac{0,085}{12} \right)^{60}$ $P = \frac{120\,000}{\left(1 + \frac{0,085}{12} \right)^{60}}$ $P = R78\,570$
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Activity 2

	$A = P(1 - i)^n$ $A = 250\,000 \left(1 + \frac{0,125}{4} \right)^{20}$ $A = R132\,487,32$
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Activity 3

	$A = P(1 + i)^n$ $40\,000 = 20\,000 \left(1 + \frac{i}{12} \right)^{36}$ $\left(1 + \frac{i}{12} \right)^{36} = \frac{40\,000}{20\,000}$ $\left(1 + \frac{i}{12} \right)^{36} = 2$ $\frac{i}{12} = 2^{\frac{1}{36}} - 1$ $r = 1200 \left[2^{\frac{1}{36}} - 1 \right]$ $r = 23,33\% \text{p.a.}$
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Activity 4

	$A = P(1 + i)^n$ $25\,000 = 13\,760 \left(1 + \frac{i}{12} \right)^{60}$ $\left(1 + \frac{i}{12} \right)^{60} = \frac{25\,000}{13\,760}$ $\frac{i}{12} = \left(\frac{25\,000}{13\,760} \right)^{\frac{1}{60}} - 1$ $r = 1200 \left[\left(\frac{25\,000}{13\,760} \right)^{\frac{1}{60}} - 1 \right]$ $r = 12\% \text{p.a.}$
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Activity 5

$A = P(1 + i)^n$ $130\,000 = 65\,000 \left(1 + \frac{i}{4}\right)^{20}$ $\left(1 + \frac{i}{4}\right)^{20} = \frac{130\,000}{65\,000}$ $\left(1 + \frac{i}{4}\right)^{20} = 2$ $\frac{i}{4} = 2^{\frac{1}{20}} - 1$ $r = 400 \left[2^{\frac{1}{20}} - 1\right]$ $r = 14,11\% \text{p.a.}$

Activity 6

$A = P(1 + i)^n$ $A = 5\,000 \left(1 + \frac{0,075}{4}\right)^{40}$ $A = R10\,511,75$ $A = P(1 + in)$ $10\,511,75 = 5\,000 \left(1 + \frac{r}{100} \cdot 10\right)$ $1 + \frac{r}{10} = 2,10235$ $r = 10(2,10235 - 1)$ $r = 11,02\% \text{p.a.}$

Activity 7

$A = P(1 - in)$ $A = 85\,000(1 - 0,12 \times 3)$ $A = R54\,400$ $A = P(1 - i)^n$ $54\,400 = 85\,000(1 - i)^3$ $1 - i = \left(\frac{54\,400}{85\,000}\right)^{\frac{1}{3}}$ $\frac{r}{100} = 1 - \left(\frac{54\,400}{85\,000}\right)^{\frac{1}{3}}$ $r = 100 \left[1 - \left(\frac{54\,400}{85\,000}\right)^{\frac{1}{3}}\right]$ $r = 13,82\% \text{p.a.}$

TUTORIAL 2

Activity 1

$A_1 = P(1 + i)^n$ $A_1 = 90\,000 \left(1 + \frac{0,065}{12}\right)^{36}$ $A_1 = R109\,320,4464$ $A_2 = A_1(1 + i)^n$ $A_2 = 109\,320,4464 \left(1 + \frac{0,07}{4}\right)^{16}$ $A_2 = R144\,295,27^C$
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Activity 2

$A_1 = P(1 + i)^n$ $A_1 = 10\,000 \left(1 + \frac{0,08}{12}\right)^{12}$ $A_1 = R10\,829,99507$ $A_2 = (A_1 + 500)(1 + i)^n$ $A_2 = (10\,829,99507 + 500) \left(1 + \frac{0,08}{12}\right)^{12}$ $A_2 = R12\,207,37907$ $A_3 = A_2(1 + i)^n$ $A_3 = 12\,270,37907 \left(1 + \frac{0,115}{2}\right)^6$ $A_3 = R17\,160,90693$ $A_4 = (A_3 + 1\,000)(1 + i)^n$ $A_4 = (17\,160,90693 + 1000) \left(1 + \frac{0,115}{2}\right)^2$ $A_4 = R20\,309,46$

Activity 3

$A_1 = P(1 + i)^n$ $A_1 = P \left(1 + \frac{0,1}{12}\right)^{72}$ $A_2 = (A_1 + 5\,000)(1 + i)^n$ $20\,000 = \left[P \left(1 + \frac{0,1}{12}\right)^{72} + 5\,000 \right] \left(1 + \frac{0,1}{12}\right)^{48}$ $\frac{20\,000}{\left(1 + \frac{0,1}{12}\right)^{48}} = P \left(1 + \frac{0,1}{12}\right)^{72} + 5\,000$
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$\frac{20\,000}{\left(1 + \frac{0,1}{12}\right)^{48}} - 5\,000 = P \left(1 + \frac{0,1}{12}\right)^{72}$ $P = \left[\frac{20\,000}{\left(1 + \frac{0,1}{12}\right)^{48}} - 5\,000 \right] \div \left(1 + \frac{0,1}{12}\right)^{72}$ $P = R4\,637,25^C$
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Activity 4

$A_1 = P(1 + i)^n$ $A_1 = P \left(1 + \frac{0,12}{12}\right)^{24}$ $A_2 = (A_1 + 8\,000) \left(1 + \frac{0,12}{12}\right)^{24}$ $A_2 = \left[P \left(1 + \frac{0,12}{12}\right)^{24} + 8\,000 \right] \left(1 + \frac{0,12}{12}\right)^{24}$ $A_3 = \left[\left[P \left(1 + \frac{0,12}{12}\right)^{24} + 8\,000 \right] \left(1 + \frac{0,12}{12}\right)^{24} - 1\,000 \right] \left(1 + \frac{0,12}{12}\right)^{48}$ $30\,000 = \left[\left[P \left(1 + \frac{0,12}{12}\right)^{24} + 8\,000 \right] \left(1 + \frac{0,12}{12}\right)^{24} - 1\,000 \right] \left(1 + \frac{0,12}{12}\right)^{48}$ $\frac{30\,000}{\left(1 + \frac{0,12}{12}\right)^{48}} = \left[P \left(1 + \frac{0,12}{12}\right)^{24} + 8\,000 \right] \left(1 + \frac{0,12}{12}\right)^{24} - 1\,000$ $\frac{30\,000}{\left(1 + \frac{0,12}{12}\right)^{48}} + 1\,000 = \left[P \left(1 + \frac{0,12}{12}\right)^{24} + 8\,000 \right] \left(1 + \frac{0,12}{12}\right)^{24}$ $P \left(1 + \frac{0,12}{12}\right)^{24} = \frac{\frac{30\,000}{\left(1 + \frac{0,12}{12}\right)^{48}} + 1\,000}{\left(1 + \frac{0,12}{12}\right)^{24}} - 8\,000$ $P = \left[\frac{30\,000}{\left(1 + \frac{0,12}{12}\right)^{48}} + 1\,000 \right] - \frac{8\,000}{\left(1 + \frac{0,12}{12}\right)^{24}}$ $P = R13\,307,28$
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TUTORIAL 5

Activity 1

$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{1200 \left[\left(1 + \frac{0,06}{12}\right)^{97} - 1 \right]}{\frac{0,06}{12}}$ $F = R149\,331,22$

Activity 2

$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{2200 \left[\left(1 + \frac{0,06}{12}\right)^{121} - 1 \right]}{\frac{0,06}{12}}$ $F = R364\,537,24$
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Activity 3

$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{10000[(1 + 0,16)^{21} - 1]}{0,16}$ $F = R1\,348\,405,06$
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Activity 4

$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{3000 \left[\left(1 + \frac{0,1}{12}\right)^{145} - 1 \right]}{\frac{0,1}{12}}$ $F = R839\,224,58$
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Activity 5

$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{1200 \left[\left(1 + \frac{0,12}{2}\right)^{43} - 1 \right]}{\frac{0,12}{12}}$ $F = R225\,009,09$
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TUTORIAL 6

Activity 1

$$F = \frac{x[(1+i)^n - 1]}{i}$$
$$F = \frac{6000 \left[\left(1 + \frac{0,08}{4}\right)^{37} - 1 \right]}{\frac{0,08}{4}}$$
$$F = R324\,205,53$$

Activity 2

$$F = \frac{x[(1+i)^n - 1]}{i}$$
$$400\,000 = \frac{x \left[\left(1 + \frac{0,08}{12}\right)^{61} - 1 \right]}{\frac{0,08}{12}}$$
$$x = \frac{400\,000 \left(\frac{0,08}{12} \right)}{\left[\left(1 + \frac{0,08}{12}\right)^{61} - 1 \right]}$$
$$x = R1\,778,71$$

Activity 3

$$F = \frac{x[(1+i)^n - 1]}{i}$$
$$1\,000\,000 = \frac{x \left[\left(1 + \frac{0,24}{12}\right)^{240} - 1 \right]}{\frac{0,24}{12}}$$
$$x = \frac{1\,000\,000 \left(\frac{0,24}{12} \right)}{\left[\left(1 + \frac{0,24}{12}\right)^{240} - 1 \right]}$$
$$x = R174,08$$

Activity 4

$$F = \frac{x[(1+i)^n - 1]}{i}$$
$$F = \frac{3\,000 \left[\left(1 + \frac{0,18}{12}\right)^{94} - 1 \right]}{\frac{0,18}{12}}$$
$$F = R610\,658,55$$

TUTORIAL 7

Activity 1

1.1	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{900 \left[\left(1 + \frac{0,18}{12}\right)^{61} - 1 \right]}{\frac{0,18}{12}}$ $F = R88\,792,08$
1.2	$F = \frac{x[(1+i)^n - 1]}{i} (1+i)^n$ $F = \frac{900 \left[\left(1 + \frac{0,18}{12}\right)^{61} - 1 \right]}{\frac{0,18}{12}} \left(1 + \frac{0,1}{4}\right)^8$ $F = R108\,184,53$

Activity 2

	$F = \frac{x[(1+i)^n - 1]}{i} (1+i)^n$ $F = \frac{2\,000 \left[\left(1 + \frac{0,15}{12}\right)^{480} - 1 \right]}{\frac{0,15}{12}} \left(1 + \frac{0,15}{12}\right)^1$ $F = R62\,807\,510,92$
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Activity 3

3.1	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{1\,700 \left[\left(1 + \frac{0,08}{12}\right)^{121} - 1 \right]}{\frac{0,08}{12}}$ $F = R314\,781,65$
3.2	$F = \frac{x[(1+i)^n - 1]}{i} (1+i)^n$ $F = \frac{1\,700 \left[\left(1 + \frac{0,06}{12}\right)^{61} - 1 \right]}{\frac{0,06}{12}} \left(1 + \frac{0,1}{2}\right)^1$ $F = R330\,520,73$

TUTORIAL 8

Activity 1

1.1	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{2\,000 \left[\left(1 + \frac{0,06}{12}\right)^{61} - 1 \right]}{\frac{0,06}{12}}$ $F = R142\,237,76$
1.2	$F = \frac{x[(1+i)^n - 1]}{i} (1+i)^n$ $F = \frac{2\,000 \left[\left(1 + \frac{0,06}{12}\right)^{59} - 1 \right]}{\frac{0,06}{12}} \left(1 + \frac{0,06}{12}\right)^2$ $F = R143\,663,69$

Activity 2

	$F = \frac{x[(1+i)^n - 1]}{i}$ $10\,000 = \frac{500 \left[\left(1 + \frac{0,16}{12}\right)^n - 1 \right]}{\frac{0,16}{12}}$ $\left(1 + \frac{0,16}{12}\right)^n = \left(\frac{10\,000}{500}\right) \left(\frac{0,16}{12}\right) + 1$ $\left(\frac{76}{75}\right)^n = \frac{19}{15}$ $n = \frac{\log\left(\frac{19}{15}\right)}{\log\left(\frac{76}{75}\right)}$ $n = 18$
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Activity 3

	$F = \frac{x[(1+i)^n - 1]}{i}$ $25\,000 = \frac{1\,000 \left[\left(1 + \frac{0,14}{4}\right)^n - 1 \right]}{\frac{0,14}{4}}$ $\left(1 + \frac{0,14}{4}\right)^n = \left(\frac{25\,000}{1\,000}\right) \left(\frac{0,14}{4}\right) + 1$ $\left(\frac{207}{200}\right)^n = \frac{15}{8}$
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$n = \frac{\log\left(\frac{15}{8}\right)}{\log\left(\frac{207}{200}\right)}$ $n = 18$

Activity 4

$F = \frac{x[(1+i)^n - 1]}{i}$ $100\,000 = \frac{2\,000 \left[\left(1 + \frac{0,16}{2}\right)^n - 1 \right]}{\frac{0,16}{2}}$ $\left(1 + \frac{0,16}{2}\right)^n = \left(\frac{100\,000}{2\,000}\right) \left(\frac{0,16}{2}\right) + 1$ $\left(\frac{27}{25}\right)^n = 5$ $n = \frac{\log(5)}{\log\left(\frac{27}{25}\right)}$ $n = 21$
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TUTORIAL 9

Activity 1

1.1	$A = P(1 - i)^n$ $A = 200\,000(1 - 0,2)^5$ $A = R65\,536$
1.2	$A = P(1 + i)^n$ $A = 200\,000(1 + 0,16)^5$ $A = R420\,068,33$
1.3	$SF = CP - SV$ $SF = R420\,068,33 - R65\,536$ $SF = R354\,532,33$
1.4	$F = \frac{x[(1 + i)^n - 1]}{i}$ $354\,532,33 = \frac{x \left[\left(1 + \frac{0,18}{12}\right)^{61} - 1 \right]}{\frac{0,18}{12}}$ $x = \frac{354\,532,33 \left(\frac{0,18}{12}\right)}{\left[\left(1 + \frac{0,18}{12}\right)^{61} - 1 \right]}$ $x = R3\,593,55$
1.5	(a) Withdrawal by end of first year: $A = 3\,000 \left(1 + \frac{0,18}{12}\right)^{48} \rightarrow R6\,130,43$ Withdrawal by end of second year: $A = 3\,000 \left(1 + \frac{0,18}{12}\right)^{36} \rightarrow R5\,127,42$ Withdrawal by end of third year: $A = 3\,000 \left(1 + \frac{0,18}{12}\right)^{24} \rightarrow R4\,288,51$ Withdrawal by end of fourth year: $A = 3\,000 \left(1 + \frac{0,18}{12}\right)^{12} \rightarrow R3\,586,85$ Withdrawal by end of fifth year: $A = 3\,000 \rightarrow R3\,000$ Total amount lost on sinking fund: $R22\,133,21$ Reduced value of the sinking fund: $R354\,532,33 - R22\,133,21$ $R332\,399,12$ b) Sinking fund replacement and service: $R354\,532,33 + R22\,133,21$ $R376\,665,54$ $F = \frac{x[(1 + i)^n - 1]}{i}$ $376\,665,54 = \frac{x \left[\left(1 + \frac{0,18}{12}\right)^{61} - 1 \right]}{\frac{0,18}{12}}$ $x = \frac{376\,665,54 \left(\frac{0,18}{12}\right)}{\left[\left(1 + \frac{0,18}{12}\right)^{61} - 1 \right]}$

	$x = R3\,817,90$
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Activity 2

2.1	$A = P(1 - i)^n$ $A = 140\,000(1 - 0,2)^6$ $A = R36\,700,58$
2.2	$A = P(1 + i)^n$ $A = 140\,000(1 + 0,18)^6$ $A = R377\,937,58$
2.3	$SF = CP - SV$ $SF = R377\,937,58 - R36\,700,16$ $SF = R341\,237,42$
2.4	$F = \frac{x[(1 + i)^n - 1]}{i}$ $341\,237,42 = \frac{x \left[\left(1 + \frac{0,132}{12}\right)^{72} - 1 \right]}{\frac{0,132}{12}}$ $x = \frac{341\,237,42 \left(\frac{0,132}{12}\right)}{\left[\left(1 + \frac{0,132}{12}\right)^{72} - 1 \right]}$ $x = R3\,132,50$
2.5.1	Withdrawal by end of first year: $A = 4\,000 \left(1 + \frac{0,132}{12}\right)^{60} \rightarrow R7\,711,33$ Withdrawal by end of second year: $A = 4\,000 \left(1 + \frac{0,132}{12}\right)^{48} \rightarrow R6\,762,63$ Withdrawal by end of third year: $A = 4\,000 \left(1 + \frac{0,132}{12}\right)^{36} \rightarrow R5\,930,64$ Withdrawal by end of fourth year: $A = 4\,000 \left(1 + \frac{0,132}{12}\right)^{24} \rightarrow R5\,201,01$ Withdrawal by end of fifth year: $A = 4\,000 \left(1 + \frac{0,132}{12}\right)^{12} \rightarrow R4\,561,14$ Withdrawal by end of sixth year: $A = 4\,000 \rightarrow R4\,000$ Total amount lost on sinking fund: $R34\,166,75$ Reduced value of the sinking fund: $R341\,237,43 - R34\,166,67$ $R307\,070,67$
2.5.2	Sinking fund for replacement and service: $R341\,237,43 + R34\,166,67$ $R375\,404,17$ $F = \frac{x[(1 + i)^n - 1]}{i}$ $375\,404,17 = \frac{x \left[\left(1 + \frac{0,132}{12}\right)^{72} - 1 \right]}{\frac{0,132}{12}}$

	$x = \frac{376\,665,54 \left(\frac{0,132}{12}\right)}{\left[\left(1 + \frac{0,132}{12}\right)^{72} - 1\right]}$ $x = R3\,446,14$
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Activity 3

3.1	$A = P(1 - i)^n$ $A = 2267\,851(1 - 0,23)^5$ $A = R61\,674,35$
3.2	$A = P(1 + i)^n$ $A = 227\,851(1 + 0,17)^5$ $A = R499\,551,48$
3.3	$F = \frac{x[(1 + i)^n - 1]}{i}(1 + i)^n$ $437\,877,13 = \frac{x \left[\left(1 + \frac{0,115}{12}\right)^{57} - 1 \right]}{\left(\frac{0,115}{12}\right)} \left(1 + \frac{0,115}{12}\right)^3$ $x = \frac{437\,877,13 \left(\frac{0,115}{12}\right)}{\left[\left(1 + \frac{0,115}{12}\right)^{57} - 1 \right] \left(1 + \frac{0,115}{12}\right)^3}$ $x = R5\,645,94$

TUTORIAL 10

Activity 1

	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $140\,000 = \frac{x \left[1 - \left(1 + \frac{0,114}{12}\right)^{-72} \right]}{\left(\frac{0,114}{12}\right)}$ $x = \frac{140\,000 \left(\frac{0,114}{12}\right)}{\left[1 - \left(1 + \frac{0,114}{12}\right)^{-72} \right]}$ $x = R2\,349,05$
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Activity 2

2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $1\,200\,000 = \frac{x \left[1 - \left(1 + \frac{0,1}{12} \right)^{-240} \right]}{\left(\frac{0,1}{12} \right)}$ $x = \frac{1\,200\,000 \left(\frac{0,1}{12} \right)}{\left[1 - \left(1 + \frac{0,1}{12} \right)^{-240} \right]}$ $x = R11\,580,26$
2.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{11\,580,26 \left[1 - \left(1 + \frac{0,1}{12} \right)^{-120} \right]}{\left(\frac{0,1}{12} \right)}$ $OB = R876\,291,75$

Activity 3

3.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $180\,000 = \frac{x \left[1 - \left(1 + \frac{0,12}{12} \right)^{-60} \right]}{\left(\frac{0,12}{12} \right)}$ $x = \frac{180\,000 \left(\frac{0,12}{12} \right)}{\left[1 - \left(1 + \frac{0,12}{12} \right)^{-60} \right]}$ $x = R4\,004$
3.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{4\,004 \left[1 - \left(1 + \frac{0,12}{12} \right)^{-24} \right]}{\left(\frac{0,12}{12} \right)}$ $OB = R85\,058,52$

Activity 4

4.1	$\text{Loan} = \text{Cost price} - \text{Deposit}$ $\text{Loan} = R1\,800\,000 - \frac{20}{100} \times R1\,800\,000$ $\text{Loan} = R1\,440\,000$
4.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $1\,440\,000 = \frac{x \left[1 - \left(1 + \frac{0,096}{12} \right)^{-300} \right]}{\left(\frac{0,096}{12} \right)}$ $x = \frac{1\,200\,000 \left(\frac{0,096}{12} \right)}{\left[1 - \left(1 + \frac{0,096}{12} \right)^{-300} \right]}$ $x = R12\,681,48$
4.3	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{12\,681,48 \left[1 - \left(1 + \frac{0,096}{12} \right)^{-180} \right]}{\left(\frac{0,096}{12} \right)}$ $OB = R1\,207\,452,66$
4.4	$\text{Interest} = R1\,521\,777,60 - R975\,906,15$ $\text{Interest} = R545\,871,45$

Activity 5

5.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $192\,000 = \frac{x \left[1 - \left(1 + \frac{0,12}{12} \right)^{-60} \right]}{\left(\frac{0,12}{12} \right)}$ $x = \frac{192\,000 \left(\frac{0,12}{12} \right)}{\left[1 - \left(1 + \frac{0,12}{12} \right)^{-60} \right]}$ $x = R4\,270,93$
5.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{4\,270,93 \left[1 - \left(1 + \frac{0,12}{12} \right)^{-15} \right]}{\left(\frac{0,12}{12} \right)}$ $OB = R59\,216,67$

TUTORIAL 11

Activity 1

1.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $650\,000 = \frac{x \left[1 - \left(1 + \frac{0,18}{12} \right)^{-180} \right]}{\left(\frac{0,18}{12} \right)}$ $x = \frac{650\,000 \left(\frac{0,18}{12} \right)}{\left[1 - \left(1 + \frac{0,18}{12} \right)^{-180} \right]}$ $x = R10\,467,74$
1.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{10\,467,74 \left[1 - \left(1 + \frac{0,18}{12} \right)^{-60} \right]}{\left(\frac{0,18}{12} \right)}$ $OB = R412\,222,42$

Activity 2

2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $P = \frac{2\,169,18 \left[1 - \left(1 + \frac{0,16}{12} \right)^{-72} \right]}{\left(\frac{0,16}{12} \right)}$ $OB = R100\,000$
2.2	$Interest = (x \times n) - P$ $Interest = (R2\,169,18 \times 72) - R100\,000$ $Interest = R56\,180,96$

Activity 3

3.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $76\,000 = \frac{x \left[1 - \left(1 + \frac{0,07}{12} \right)^{-72} \right]}{\left(\frac{0,07}{12} \right)}$ $x = \frac{76\,000 \left(\frac{0,07}{12} \right)}{\left[1 - \left(1 + \frac{0,07}{12} \right)^{-72} \right]}$ $x = R1\,295,72$
3.2	Total amount payable = $x \times n$ Total amount payable = $(R1\,295,72 \times 72)$ Total amount payable = $R93\,291,84$

Activity 4

4.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $4\,000\,000 = \frac{x \left[1 - \left(1 + \frac{0,11}{4} \right)^{-16} \right]}{\left(\frac{0,11}{4} \right)}$ $x = \frac{4\,000\,000 \left(\frac{0,11}{4} \right)}{\left[1 - \left(1 + \frac{0,11}{4} \right)^{-16} \right]}$ $x = R312\,388,39$
4.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{312\,388,39 \left[1 - \left(1 + \frac{0,11}{4} \right)^{-8} \right]}{\left(\frac{0,11}{4} \right)}$ $OB = R2\,216\,181,46$

Activity 5

5.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $97\,500 = \frac{x \left[1 - \left(1 + \frac{0,13}{12} \right)^{-36} \right]}{\left(\frac{0,13}{12} \right)}$ $x = \frac{97\,500 \left(\frac{0,13}{12} \right)}{\left[1 - \left(1 + \frac{0,13}{12} \right)^{-36} \right]}$
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	$x = R3\,285,16$
5.2	Interest paid = $x \times n$ Interest paid = $(R3\,285,16 \times 36) - R97\,500$ Interest paid = $R20\,765,76$

TUTORIAL 12

Activity 1

1.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $1\,400\,000 = \frac{x \left[1 - \left(1 + \frac{0,09}{12} \right)^{-240} \right]}{\left(\frac{0,09}{12} \right)}$ $x = \frac{97\,500 \left(\frac{0,09}{12} \right)}{\left[1 - \left(1 + \frac{0,09}{12} \right)^{-240} \right]}$ $x = R12\,596,16$ $\text{Interest paid} = R12\,596,16 - \frac{R12\,596,16 \left[1 - \left(1 + \frac{0,09}{12} \right)^{-1} \right]}{\left(\frac{0,09}{12} \right)}$ $\text{Interest paid} = R93,77$
1.2	$\text{Interest paid} = (R12\,596,12 \times 240) - \frac{R12\,596,16 \left[1 - \left(1 + \frac{0,09}{12} \right)^{-240} \right]}{\left(\frac{0,09}{12} \right)}$ $\text{Interest paid} = R1\,623\,078,78$

Activity 2

2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $2\,000\,000 = \frac{x \left[1 - \left(1 + \frac{0,085}{12} \right)^{-180} \right]}{\left(\frac{0,085}{12} \right)}$ $x = \frac{2\,000\,000 \left(\frac{0,085}{12} \right)}{\left[1 - \left(1 + \frac{0,085}{12} \right)^{-180} \right]}$ $x = R19\,694,79$
2.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$

	$OB = \frac{19\,694,79 \left[1 - \left(1 + \frac{0,085}{12} \right)^{-120} \right]}{\left(\frac{0,085}{12} \right)}$ $OB = R1\,588\,472,85$
2.3	Total amount payable = $x \times n$ Total amount payable = $R19\,694,79 \times 60$ Total amount payable = $R1\,181\,687,40$
2.4	$\text{Interest paid} = R1\,181\,687,40 - \frac{R12\,596,16 \left[1 - \left(1 + \frac{0,09}{12} \right)^{-60} \right]}{\left(\frac{0,09}{12} \right)}$ $\text{Interest paid} = R221\,740,04$

Activity 3

3.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $P = \frac{3\,000 \left[1 - \left(1 + \frac{0,18}{12} \right)^{-72} \right]}{\left(\frac{0,18}{12} \right)}$ $P = R131\,534$
3.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{3\,000 \left[1 - \left(1 + \frac{0,18}{12} \right)^{-52} \right]}{\left(\frac{0,18}{12} \right)}$ $OB = R107\,786,23$
3.3	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{3\,000 \left[1 - \left(1 + \frac{0,18}{12} \right)^{-12} \right]}{\left(\frac{0,18}{12} \right)}$ $OB = R32\,722,52$

Activity 4

4.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $P = \frac{2\,000 \left[1 - \left(1 + \frac{0,18}{4} \right)^{-40} \right]}{\left(\frac{0,18}{4} \right)}$ $P = R36\,803,17$
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4.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{2\,000 \left[1 - \left(1 + \frac{0,18}{4} \right)^{-10} \right]}{\left(\frac{0,18}{4} \right)}$ $OB = R15\,825,44$
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Activity 5

5.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $120\,000 = \frac{x \left[1 - \left(1 + \frac{0,12}{12} \right)^{-48} \right]}{\left(\frac{0,12}{12} \right)}$ $x = \frac{120\,000 \left(\frac{0,12}{12} \right)}{\left[1 - \left(1 + \frac{0,12}{12} \right)^{-48} \right]}$ $x = R3\,160,06$
5.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{3\,160,06 \left[1 - \left(1 + \frac{0,12}{12} \right)^{-28} \right]}{\left(\frac{0,12}{12} \right)}$ $OB = R76\,841,42$

TUTORIAL 13

Activity 1

	$A = P(1 + i)^n$ $A = 110\,000 \left(1 + \frac{0,1}{12} \right)^2$ $A = R111\,840,97$ $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $111\,840,97 = \frac{x \left[1 - \left(1 + \frac{0,1}{12} \right)^{-46} \right]}{\left(\frac{0,12}{12} \right)}$ $x = \frac{111\,840,97 \left(\frac{0,1}{12} \right)}{\left[1 - \left(1 + \frac{0,1}{12} \right)^{-46} \right]}$ $x = R2\,937,02$
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Activity 2

	Starting in one month's time: $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $600\,000 = \frac{x \left[1 - \left(1 + \frac{0,095}{12} \right)^{-72} \right]}{\left(\frac{0,095}{12} \right)}$ $x = \frac{111\,840,97 \left(\frac{0,095}{12} \right)}{\left[1 - \left(1 + \frac{0,095}{12} \right)^{-72} \right]}$ $x = R10\,964,81$ Starting in six months' time: $A = P(1 + i)^n$ $A = 600\,000 \left(1 + \frac{0,095}{12} \right)^5$ $A = R624\,129,03$ $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $624\,129,03 = \frac{x \left[1 - \left(1 + \frac{0,095}{12} \right)^{-67} \right]}{\left(\frac{0,095}{12} \right)}$ $x = \frac{624\,129,03 \left(\frac{0,095}{12} \right)}{\left[1 - \left(1 + \frac{0,095}{12} \right)^{-67} \right]}$ $x = R12\,039,23$ Starting in one month's time: $(R10\,946,81 \times 72) = R789\,466,32$ Starting in six months' time: $(R12\,039,23 \times 67) = R806\,628,34$ Difference: $R17\,162,02$
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Activity 3

3.1	$A = P(1 + i)^n$ $A = 150\,000 \left(1 + \frac{0,07}{12} \right)^5$ $A = R154\,426,34$
3.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$

	$154\,426,34 = \frac{x \left[1 - \left(1 + \frac{0,07}{12} \right)^{-55} \right]}{\left(\frac{0,07}{12} \right)}$ $x = \frac{154\,426,34 \left(\frac{0,07}{12} \right)}{\left[1 - \left(1 + \frac{0,07}{12} \right)^{-55} \right]}$ $x = R3\,290,32$
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Activity 4

4.1	$A = P(1 + i)^n$ $A = 180\,000 \left(1 + \frac{0,105}{12} \right)^2$ $A = R183\,163,78$
4.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $183\,163,78 = \frac{x \left[1 - \left(1 + \frac{0,105}{12} \right)^{-55} \right]}{\left(\frac{0,105}{12} \right)}$ $x = \frac{183\,163,78 \left(\frac{0,105}{12} \right)}{\left[1 - \left(1 + \frac{0,105}{12} \right)^{-55} \right]}$ $x = R4\,209,89$

Activity 5

5.1	$A = P(1 + i)^n$ $A = 350\,000 \left(1 + \frac{0,058}{12} \right)^6$ $A = R360\,273,44$
5.2	$A = P(1 + i)^n$ $A = 350\,000 \left(1 + \frac{0,058}{12} \right)^8$ $A = R363\,764,50$ $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $363\,764,50 = \frac{x \left[1 - \left(1 + \frac{0,058}{12} \right)^{-64} \right]}{\left(\frac{0,058}{12} \right)}$

$x = \frac{363\,764,50 \left(\frac{0,058}{12}\right)}{\left[1 - \left(1 + \frac{0,058}{12}\right)^{-64}\right]}$ $x = R6\,621,78$

Activity 6

$A = P(1 + i)^n$ $A = 150\,000 \left(1 + \frac{0,118}{12}\right)^8$ $A = R1\,622\,142,03$ $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $1\,622\,142,03 = \frac{x \left[1 - \left(1 + \frac{0,118}{12}\right)^{-52}\right]}{\left(\frac{0,118}{12}\right)}$ $x = \frac{365\,522,69 \left(\frac{0,118}{12}\right)}{\left[1 - \left(1 + \frac{0,118}{12}\right)^{-52}\right]}$ $x = R39\,997,17$
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Activity 7

$A = P(1 + i)^n$ $A = 1\,20\,000 \left(1 + \frac{0,09}{12}\right)^3$ $A = R1\,227\,203,01$ $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $1\,227\,203,01 = \frac{x \left[1 - \left(1 + \frac{0,09}{12}\right)^{-56}\right]}{\left(\frac{0,09}{12}\right)}$ $x = \frac{1\,227\,203,01 \left(\frac{0,09}{12}\right)}{\left[1 - \left(1 + \frac{0,09}{12}\right)^{-56}\right]}$ $x = R26\,918,43$
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Activity 8

8.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $2\,000\,000 = \frac{x \left[1 - \left(1 + \frac{0,12}{12} \right)^{-12} \right]}{\left(\frac{0,12}{12} \right)}$ $x = \frac{2\,000\,000 \left(\frac{0,12}{12} \right)}{\left[1 - \left(1 + \frac{0,12}{12} \right)^{-12} \right]}$ $x = R177\,697,58$
8.2	$A = P(1 + i)^n$ $A = 200\,000 \left(1 + \frac{0,12}{12} \right)^2$ $A = R2\,040\,200$ $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $2\,040\,200 = \frac{x \left[1 - \left(1 + \frac{0,12}{12} \right)^{-10} \right]}{\left(\frac{0,12}{12} \right)}$ $x = \frac{1\,227\,203,01 \left(\frac{0,12}{12} \right)}{\left[1 - \left(1 + \frac{0,12}{12} \right)^{-10} \right]}$ $x = R215\,408,55$

Activity 9

9.1	$A = P(1 + i)^n$ $A = 220\,000 \left(1 + \frac{0,105}{12} \right)^7$ $A = R233\,833,93$ $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $233\,833,93 = \frac{x \left[1 - \left(1 + \frac{0,105}{12} \right)^{-29} \right]}{\left(\frac{0,105}{12} \right)}$ $x = \frac{233\,833,93 \left(\frac{0,105}{12} \right)}{\left[1 - \left(1 + \frac{0,105}{12} \right)^{-29} \right]}$ $x = R9\,164,52$
9.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$

	$OB = \frac{9\,164,52 \left[1 - \left(1 + \frac{0,105}{12} \right)^{-12} \right]}{\left(\frac{0,105}{12} \right)}$ $OB = R943\,407,01$
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TUTORIAL 14

Activity 1

1.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $500\,000 = \frac{6\,000 \left[1 - \left(1 + \frac{0,09}{12} \right)^{-n} \right]}{\left(\frac{0,09}{12} \right)}$ $\left(\frac{500\,000}{6\,000} \right) \left(\frac{0,09}{12} \right) = 1 - \left(1 + \frac{0,09}{12} \right)^{-n}$ $\frac{5}{8} = 1 - \left(\frac{403}{400} \right)^{-n}$ $\left(\frac{403}{400} \right)^{-n} = 1 - \frac{5}{8}$ $\left(\frac{403}{400} \right)^{-n} = \frac{3}{8}$ $\left(\frac{403}{400} \right)^n = \frac{8}{3}$ $n = \frac{\log \left(\frac{8}{3} \right)}{\log \left(\frac{403}{400} \right)}$ $n = 131,2670376$ $\therefore n = 131 \text{ full payments of R6\,000}$
1.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{6\,000 \left[1 - \left(1 + \frac{0,09}{12} \right)^{-0,2670376} \right]}{\left(\frac{0,09}{12} \right)}$ $OB = R1\,594,66$
1.3	$FP = OB(1 + i)^1$ $FP = 1\,594,66 \left(1 + \frac{0,09}{12} \right)^1$ $FP = R1\,606,62$

Activity 2

2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $750\,000 = \frac{55\,000 \left[1 - \left(1 + \frac{0,12}{2} \right)^{-n} \right]}{\left(\frac{0,12}{2} \right)}$ $\left(\frac{750\,000}{55\,000} \right) \left(\frac{0,12}{2} \right) = 1 - \left(1 + \frac{0,12}{2} \right)^{-n}$ $\frac{9}{11} = 1 - \left(\frac{53}{50} \right)^{-n}$ $\left(\frac{53}{50} \right)^{-n} = 1 - \frac{9}{11}$ $\left(\frac{53}{50} \right)^{-n} = \frac{2}{11}$ $\left(\frac{53}{50} \right)^n = \frac{11}{2}$ $n = \frac{\log\left(\frac{11}{2}\right)}{\log\left(\frac{53}{50}\right)}$ $n = 29,2565649$ $\therefore n = 29 \text{ full payments of R55 000}$
2.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{55\,000 \left[1 - \left(1 + \frac{0,12}{2} \right)^{-0,2565649} \right]}{\left(\frac{0,12}{2} \right)}$ $OB = R13\,602,02$
2.3	$FP = OB(1 + i)^1$ $FP = 13\,602,02 \left(1 + \frac{0,12}{2} \right)^1$ $FP = R14\,418,14$

Activity 3

3.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $350\,000 = \frac{x \left[1 - \left(1 + \frac{0,125}{12} \right)^{-240} \right]}{\left(\frac{0,125}{12} \right)}$ $x = \frac{350\,000 \left(\frac{0,125}{12} \right)}{\left[1 - \left(1 + \frac{0,125}{12} \right)^{-240} \right]}$ $x = R3\,976,49$
3.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{4000 \left[1 - \left(1 + \frac{0,125}{12} \right)^{-192} \right]}{\left(\frac{0,125}{12} \right)}$ $OB = R331\,490,85$
3.3	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $331\,490,85 = \frac{5\,000 \left[1 - \left(1 + \frac{0,125}{12} \right)^{-n} \right]}{\left(\frac{0,125}{12} \right)}$ $\left(\frac{331\,490,85}{5\,000} \right) \left(\frac{0,125}{12} \right) = 1 - \left(1 + \frac{0,125}{12} \right)^{-n}$ $(0,6906059375) = 1 - \left(\frac{97}{96} \right)^{-n}$ $\left(\frac{97}{96} \right)^{-n} = 1 - (0,6906059375)$ $\left(\frac{97}{96} \right)^{-n} = 0,3093940625$ $\left(\frac{97}{96} \right)^n = (0,3093940625)^{-1}$ $\left(\frac{97}{96} \right)^n = 3,232124081$ $n = \frac{\log(3,232124081)}{\log\left(\frac{97}{96}\right)}$ $n = 113,2069517$ $\therefore n = 113 \text{ full payments of R5 000}$
3.4	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$

	$OB = \frac{5\,000 \left[1 - \left(1 + \frac{0,125}{12} \right)^{-0,20669517} \right]}{\left(\frac{0,125}{12} \right)}$ $OB = R1\,028,30$ $FP = OB(1 + i)^1$ $FP = 1\,028,30 \left(1 + \frac{0,125}{2} \right)^1$ $FP = R1\,039,01$
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GRADE 12 EXAM-TYPE QUESTIONS

TUTORIAL 1

Activity 1

1.1	$A = P(1 + i)^n$ $23\,000 = 1\,570(1 + 0,12)^n$ $n = \frac{\log\left(\frac{23\,000}{1\,570}\right)}{\log(1,12)}$ $n = 23,69$ $n = 24 \text{ years}$
1.2.1	$A = P(1 + i)^n$ $A = 800\,000(1 + 0,08)^5$ $A = R1\,175\,462,46$ <i>Sinking fund = Cost price – Scrap value</i> $\text{Sinking fund} = R1\,175\,462,46 - R200\,000$ $\text{Sinking fund} = R975\,462,46$
1.2.2	$F = \frac{x[(1 + i)^n - 1]}{i}$ $975\,462,46 = \frac{x\left[\left(1 + \frac{0,12}{12}\right)^{60} - 1\right]}{\frac{0,12}{12}}$ $x = \frac{975\,462,46\left(\frac{0,12}{12}\right)}{\left[\left(1 + \frac{0,12}{12}\right)^{60} - 1\right]}$ $x = R11\,944,00$
1.2.3	$A = P(1 + i)^n$ $A = 5\,000\left(1 + \frac{0,12}{12}\right)^{48} \rightarrow R8\,061,13$ $A = 5\,000\left(1 + \frac{0,12}{12}\right)^{36} \rightarrow R7\,153,84$ $A = 5\,000\left(1 + \frac{0,12}{12}\right)^{24} \rightarrow R6\,348,67$ $A = 5\,000\left(1 + \frac{0,12}{12}\right)^{12} \rightarrow R5\,634,13$ $A = 5\,000 \rightarrow R5\,000$ <i>Total amount lost due to withdrawals = R32 197,77</i> $x = \frac{(975\,462,46 + 32\,197,77)\left(\frac{0,12}{12}\right)}{\left[\left(1 + \frac{0,12}{12}\right)^{60} - 1\right]}$ $x = R12\,338,24$

Activity 2

2.1	$A = P(1 + i)^n$ $2\,860 = 2\,000 \left(1 + \frac{r}{1\,200}\right)^{18}$ $1 + \frac{r}{1\,200} = \left(\frac{2\,860}{2\,000}\right)^{\frac{1}{18}}$ $\frac{r}{1\,200} = \left(\frac{2\,860}{2\,000}\right)^{\frac{1}{18}} - 1$ $r = 1200 \left[\left(\frac{2\,860}{2\,000}\right)^{\frac{1}{18}} - 1 \right]$ $r = 24,08\% \text{p.a.}$
2.2	$F = \frac{x[(1 + i)^n - 1]}{i}$ $F = \frac{100 \left[\left(1 + \frac{0,08}{12}\right)^{12} - 1 \right]}{\frac{0,08}{12}}$ $F = R1\,244,99$ No, it is short by R55,01

Activity 3

3.1	$A = P(1 - i)^n$ $A = 7\,200(1 - 0,25)^3$ $A = R3\,037,50$
3.2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $300\,000 = \frac{5\,000 \left[1 - \left(1 + \frac{0,18}{12}\right)^{-n} \right]}{\frac{0,18}{12}}$ $1 - \left(\frac{203}{200}\right)^{-n} = \left(\frac{300\,000}{5\,000}\right) \left(\frac{0,18}{12}\right)$ $\left(\frac{200}{203}\right)^n = 1 - \left(\frac{300\,000}{5\,000}\right) \left(\frac{0,18}{12}\right)$ $\left(\frac{200}{203}\right)^n = \frac{1}{10}$ $n = \frac{\log\left(\frac{1}{10}\right)}{\log\left(\frac{200}{203}\right)}$ $n = 154,6541086. \text{ Therefore, there are 154 payments of full R5\,000 each and a } 155^{\text{th}} \text{ payment which is less than R5\,000.}$ $\therefore n = 155$
3.2.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$

	$OB = \frac{5\,000 \left[1 - \left(1 + \frac{0,18}{12} \right)^{-0,6541086} \right]}{\frac{0,18}{12}}$ $OB = R3\,230,50$
3.2.3	$FP = OB(1 + i)^1$ $FP = 3\,230,50 \left(1 + \frac{0,18}{12} \right)^1$ $FP = R3\,278,96$
3.2.4	$\text{Total amount payable} = R5\,000 \times 154 + R3\,278,96$ $\text{Total amount payable} = R773\,278,50$

Activity 4

4.1	$A = P(1 + i)^n$ $2 = 1 \left(1 + \frac{i}{4} \right)^{24}$ $1 + \frac{i}{4} = 2^{\frac{1}{24}}$ $\frac{r}{400} = 2^{\frac{1}{24}} - 1$ $r = 400 \left[2^{\frac{1}{24}} - 1 \right]$ $r = 11,72\% \text{p.a.}$
4.2.1	$A = P(1 + i)^n$ $A = 10\,000 \left(1 + \frac{0,095}{12} \right)^5$ $A = R10\,402,15$
4.2.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $10\,402,15 = \frac{450 \left[1 - \left(1 + \frac{0,095}{12} \right)^{-n} \right]}{\frac{0,095}{12}}$ $1 - \left(\frac{2419}{2400} \right)^{-n} = \left(\frac{10\,402,15}{450} \right) \left(\frac{0,095}{12} \right)$ $\left(\frac{2400}{2419} \right)^n = 1 - \left(\frac{10\,402,15}{450} \right) \left(\frac{0,095}{12} \right)$ $\left(\frac{2400}{2419} \right)^n = 0,816999213$ $n = \frac{\log(0,816999213)}{\log\left(\frac{2400}{2419}\right)}$ $n = 25,6315128. \text{ Therefore, there are 25 payments of full R450 each and a 26}^{\text{th}}$ $\text{payment which is less than R450.}$ $\therefore n = 26$
4.2.3	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$

	$OB = \frac{450 \left[1 - \left(1 + \frac{0,095}{12} \right)^{-0,6315128} \right]}{\frac{0,095}{12}}$ $OB = R282,36$
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Activity 5

5.1	$A = P(1 + i)^n$ $1\,711,11 = 1\,430,77 \left(1 + \frac{i}{12} \right)^{18}$ $1 + \frac{i}{12} = \left(\frac{1\,711,11}{1\,430,77} \right)^{\frac{1}{18}}$ $\frac{i}{12} = \left(\frac{1\,711,11}{1\,430,77} \right)^{\frac{1}{18}} - 1$ $\frac{r}{1\,200} = \left(\frac{1\,711,11}{1\,430,77} \right)^{\frac{1}{18}} - 1$ $r = 1\,200 \left[\left(\frac{1\,711,11}{1\,430,77} \right)^{\frac{1}{18}} - 1 \right]$ $r = 11,99\% \text{p.a.}$
5.2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $800\,000 = \frac{10\,000 \left[1 - \left(1 + \frac{0,14}{12} \right)^{-n} \right]}{\frac{0,14}{12}}$ $1 - \left(1 + \frac{0,14}{12} \right)^{-n} = \left(\frac{800\,000}{10\,000} \right) \left(\frac{0,14}{12} \right)$ $\left(\frac{607}{600} \right)^{-n} = 1 - \left(\frac{800\,000}{10\,000} \right) \left(\frac{0,14}{12} \right)$ $\left(\frac{600}{607} \right)^n = 0,066666667$ $n = \frac{\log(0,066666667)}{\log\left(\frac{600}{607}\right)}$ $n = 233,4699958$. Therefore, there are 233 payments of full R10 000 each and a 234th payment which is less than R10 000. $n = 234$
5.2.2	Balance after the 119 th payment:

	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{10\,000 \left[1 - \left(1 + \frac{0,14}{12} \right)^{-115} \right]}{\frac{0,14}{12}}$ $OB = R631\,330,590$ Accrued amount due to the deferred payments: $A = P(1 + i)^n$ $A = 631\,330,590 \left(1 + \frac{0,14}{12} \right)^4$ $A = R661\,312,2928.$ Value of the new monthly instalment: $661\,312,2928 = \frac{x \left[1 - \left(1 + \frac{0,14}{12} \right)^{-111} \right]}{\frac{0,14}{12}}$ $x = \frac{661\,312,2928 \left(\frac{0,14}{12} \right)}{\left[1 - \left(1 + \frac{0,14}{12} \right)^{-111} \right]}$ $x = 10\,655,90$
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Activity 6

6.1	$A = P(1 - i)^n$ $1 = 2(1 - 0,07)^n$ $(0,93)^n = 0,5$ $n = \frac{\log(0,5)}{\log(0,93)}$ $n = 9,551337509$ $n = 10 \text{ years}$
6.2	Radesh: $A = P(1 + in) + 5\% \text{ of } P$ $A = 6\,000(1 + 0,085 \times 6) + \frac{5}{100} \times 6\,000$ $A = R8\,850$ Thandi: $A = P(1 + i)^n$ $A = 6\,000 \left(1 + \frac{0,08}{12} \right)^{72}$ $A = R8\,939,07$ $\therefore$ Thandi has a bigger investment than Radesh.

6.3	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{10\,000 \left[\left(1 + \frac{0,15}{12}\right)^{19} - 1 \right]}{\frac{0,15}{12}}$ $F = R212\,967,69$
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TUTORIAL 2

Activity 1

1.1	<i>Loan = 88% of R850 000</i> $\text{Loan} = \frac{88}{100} \times R850\,000$ $\text{Loan} = R748\,000$
1.2	$1 + i_{eff} = \left(1 + \frac{i_{nom}}{m}\right)^m$ $1 + i_{eff} = \left(1 + \frac{0,09}{12}\right)^{12}$ $i_{eff} = \left(1 + \frac{0,09}{12}\right)^{12} - 1$ $r_{eff} = 100 \left[\left(1 + \frac{0,09}{12}\right)^{12} - 1 \right]$ $r_{eff} = 9,4\% \text{p.a.}$ Lerato's calculation is incorrect.
1.3	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $748\,000 = \frac{x \left[1 - \left(1 + \frac{0,09}{12}\right)^{-240} \right]}{\frac{0,09}{12}}$ $x = \frac{748\,000 \left(\frac{0,09}{12} \right)}{\left[1 - \left(1 + \frac{0,09}{12}\right)^{-240} \right]}$ $x = R6\,729,95$
1.4	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $748\,000 = \frac{7\,000 \left[1 - \left(1 + \frac{0,09}{12}\right)^{-n} \right]}{\frac{0,09}{12}}$ $1 - \left(\frac{403}{400}\right)^{-n} = \left(\frac{748\,000}{7\,000}\right) \left(\frac{0,09}{12}\right)$ $\left(\frac{400}{403}\right)^n = \frac{139}{700}$

	$n = \frac{\log\left(\frac{139}{700}\right)}{\log\left(\frac{400}{403}\right)}$ $n = 216,3548168.$ Therefore, there are 216 payments of full R7 000 each and a 217th payment which is less than R7 000. $\therefore n = 18 \text{ years}$
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Activity 2

2.1.1	$A = P(1 - i)^n$ $A = 120\,000(1 - 0,09)^5$ $A = R74\,883,86$
2.1.2	$A = P(1 + i)^n$ $A = 120\,000(1 + 0,07)^5$ $A = R168\,306,21$
2.1.3	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $90\,000 = \frac{x \left[1 - \left(1 + \frac{0,085}{12} \right)^{-61} \right]}{\frac{0,085}{12}}$ $x = \frac{90\,000 \left(\frac{0,085}{12} \right)}{\left[1 - \left(1 + \frac{0,085}{12} \right)^{-61} \right]}$ $x = R1\,184,68$

Activity 3

3.1	Zizipho: $A = P(1 + in) + 4\% \text{ of } P$ $A = 5\,000(1 + 0,083 \times 4) + \frac{4}{100} \times 5\,000$ $A = R6\,860$ Lindokuhle: $A = P(1 + i)^n$ $A = 5\,000 \left(1 + \frac{0,081}{12} \right)^{48}$ $A = R6\,950,71$
3.2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $525\,000 = \frac{6\,000 \left[1 - \left(1 + \frac{0,1}{12} \right)^{-n} \right]}{\frac{0,01}{12}}$ $1 - \left(\frac{121}{120} \right)^{-n} = \left(\frac{525\,000}{6\,000} \right) \left(\frac{0,1}{12} \right)$

	$\left(\frac{120}{121}\right)^n = 1 - \left(\frac{525\,000}{6\,000}\right)\left(\frac{0,1}{12}\right)$ $\left(\frac{120}{121}\right)^n = \frac{13}{48}$ $n = \frac{\log\left(\frac{13}{48}\right)}{\log\left(\frac{120}{121}\right)}$ $n = 157,4024203.$ Therefore, there are 157 payments of full R6 000 each and a 158th payment which is less than R6 000. $\therefore n = 158 \text{ payments}$
3.2.2	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{6\,000 \left[\left(1 + \frac{0,1}{12}\right)^{108} - 1 \right]}{\frac{0,1}{12}}$ $F = R1\,044\,322,28$

Activity 4

4.1	$A = P(1 - i)^n$ $250\,000 = P(1 - 0,135)^5$ $P = \frac{250\,000}{(1 - 0,135)^5}$ $P = R516\,250$
4.2.1	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $950\,000 = \frac{x \left[1 - \left(1 + \frac{0,1425}{12}\right)^{-240} \right]}{\frac{0,1425}{12}}$ $x = \frac{950\,000 \left(\frac{0,1425}{12} \right)}{\left[1 - \left(1 + \frac{0,1425}{12}\right)^{-140} \right]}$ $x = R11\,986,33$
4.2.2	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $P = \frac{11\,986,33 \left[1 - \left(1 + \frac{0,1425}{12}\right)^{-140} \right]}{\frac{0,1425}{12}}$ $P = R816\,048,67$
4.2.3	Accrued amount due to the deferred payments: $A = P(1 + i)^n$ $A = 816\,048,67 \left(1 + \frac{0,1425}{12}\right)^4$ $A = R855\,506,9178$

	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $855\,506,9178 = \frac{x \left[1 - \left(1 + \frac{0,1425}{12} \right)^{-136} \right]}{\frac{0,1425}{12}}$ $x = \frac{855\,506,9178 \left(\frac{0,1425}{12} \right)}{\left[1 - \left(1 + \frac{0,1425}{12} \right)^{-136} \right]}$ $x = R12\,711,51$
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Activity 5

5.1.1	$A = P(1 - i)^n$ $79\,866,96 = 180\,000(1 - 0,15)^n$ $(0,85)^n = \frac{79\,866,96}{180\,000}$ $n = \frac{\log\left(\frac{79\,866,96}{180\,000}\right)}{\log(0,85)}$ $n = 5 \text{ years}$
5.1.2	$A = P(1 + i)^n$ $A = 49\,000(1 + 0,1)^5$ $A = R78\,914,99$ No, Anilla's amount is less by R951,97 than the cost price of Sizwe's car.
5.2.1	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $7\,853,15 \left[1 - \left(1 + \frac{0,1025}{12} \right)^{-134} \right]$ $OB = \frac{0,1025}{12}$ $OB = R625\,272,19$
5.2.2	Accrued amount due to deferred payments: $A = P(1 + i)^n$ $A = 625\,272,19 \left(1 + \frac{0,1025}{12} \right)^3$ $A = R641\,432,04$ The value of the new increased monthly instalment: $P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $641\,432,04 = \frac{x \left[1 - \left(1 + \frac{0,1025}{12} \right)^{-131} \right]}{\frac{0,1025}{12}}$

	$x = \frac{641\,432,04 \left(\frac{0,1025}{12}\right)}{\left[1 - \left(1 + \frac{0,1025}{12}\right)^{-131}\right]}$ $x = R8\,155,25$
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TUTORIAL 3

Activity 1

1.1.1	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{15\,000 \left[\left(1 + \frac{0,088}{4}\right)^{16} - 1 \right]}{\frac{0,088}{12}}$ $F = R283\,972,28$
1.1.2	Amount in the bank account in 3 years' time: $F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{15\,000 \left[\left(1 + \frac{0,088}{4}\right)^{12} - 1 \right]}{\frac{0,088}{12}}$ $F = R203\,459,1172$ Amount in the bank account after the withdrawal of R100 000 in 3 years' time: $F = R203\,459,1172 - R100\,000$ $F = R103\,459,1172$ Amount in the bank account at the end of the 4th years: $A = 103\,459,1172 \left(1 + \frac{0,088}{4}\right)^4 + \frac{15\,000 \left[\left(1 + \frac{0,088}{4}\right)^4 - 1 \right]}{\frac{0,088}{12}}$ $A = R161\,620,80$
1.2.1	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $1\,500\,000 = \frac{x \left[1 - \left(1 + \frac{0,105}{12}\right)^{-240} \right]}{\frac{0,105}{12}}$ $x = \frac{1\,500\,000 \left(\frac{0,105}{12} \right)}{\left[1 - \left(1 + \frac{0,105}{12}\right)^{-240} \right]}$ $x = R14\,975,70$
1.2.2	$OB = \frac{x[1 - (1+i)^{-n}]}{i}$ $OB = \frac{14\,975,70 \left[1 - \left(1 + \frac{0,105}{12}\right)^{-96} \right]}{\frac{0,105}{12}}$ $OB = R969\,927,74$

Activity 2

2.1	$A = P(1 - i)^n$ $65\,000 = 180\,000(1 - i)^8$ $(1 - i)^8 = \frac{65\,000}{180\,000}$ $1 - i = \left(\frac{65\,000}{180\,000}\right)^{\frac{1}{8}}$ $i = 1 - \left(\frac{65\,000}{180\,000}\right)^{\frac{1}{8}}$ $r = 100 \left[1 - \left(\frac{65\,000}{180\,000}\right)^{\frac{1}{8}} \right]$ $r = 11,95\% \text{p.a.}$
2.2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $850\,000 = \frac{x \left[1 - \left(1 + \frac{0,1425}{12}\right)^{-240} \right]}{\frac{0,1425}{12}}$ $x = \frac{850\,000 \left(\frac{0,1425}{12}\right)}{\left[1 - \left(1 + \frac{0,1425}{12}\right)^{-240} \right]}$ $x = R10\,724,61$
2.2.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $850\,000 = \frac{12\,869,53321 \left[1 - \left(1 + \frac{0,1425}{12}\right)^{-n} \right]}{\frac{0,1425}{12}}$ $1 - \left(\frac{1\,619}{1\,600}\right)^{-n} = \left(\frac{850\,000}{12\,869,53321}\right) \left(\frac{0,1425}{12}\right)$ $\left(\frac{1\,600}{1\,619}\right)^n = 1 - \left(\frac{850\,000}{12\,869,53321}\right) \left(\frac{0,1425}{12}\right)$ $\left(\frac{1\,600}{1\,619}\right)^n = 0,215686394$ $n = \frac{\log(0,215686394)}{\log\left(\frac{1\,600}{1\,619}\right)}$ $n = 129,9384922. \text{ Therefore, there are 129 payments of full } R12\,869,53321 \text{ each}$ $\text{and a } 130^{\text{th}} \text{ payment which is less than } R12\,869,53321.$ $n = 130$
2.3	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$

	$OB = \frac{12\,869,53321 \left[1 - \left(1 + \frac{0,1425}{12} \right)^{-0,9384922} \right]}{\frac{0,1425}{12}}$ $OB = R11\,940,53997$ $FP = OB(1 + i)^1$ $FP = 11\,940,53997 \left(1 + \frac{0,1425}{12} \right)^1$ $FP = R12\,082,33$
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Activity 3

3.1	$F = \frac{x[(1 + i)^n - 1]}{i}$ $F = \frac{2\,500 \left[\left(1 + \frac{0,15}{12} \right)^{10} - 1 \right]}{\frac{0,15}{12}}$ $F = R25\,570,07$
3.2.1	$A = P(1 + i)^n$ $A = 82\,000 \left(1 + \frac{0,15}{12} \right)^{10}$ $A = R92\,846,21$
3.2.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $92\,846,21 = \frac{3\,200 \left[1 - \left(1 + \frac{0,15}{12} \right)^{-n} \right]}{\frac{0,15}{12}}$ $1 - \left(\frac{81}{80} \right)^{-n} = \left(\frac{92\,846,21}{3\,200} \right) \left(\frac{0,15}{12} \right)$ $\left(\frac{80}{81} \right)^n = 1 - \left(\frac{92\,846,21}{3\,200} \right) \left(\frac{0,15}{12} \right)$ $\left(\frac{80}{81} \right)^n = 0,6373194922$ $n = \frac{\log(0,6373194922)}{\log\left(\frac{80}{81}\right)}$ $n = 36,26351107. \text{ Therefore, there are 36 payments of full } R3\,200 \text{ each and a } 37^{\text{th}} \text{ payment which is less than } R3\,200.$ $n = 37$
3.2.3	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$

	$OB = \frac{3\,200 \left[1 - \left(1 + \frac{0,15}{12} \right)^{-0,26351107} \right]}{\frac{0,15}{12}}$ $OB = R836,6386$ $FP = OB(1 + i)^1$ $FP = 836,6386 \left(1 + \frac{0,15}{12} \right)^1$ $FP = R847,10$
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Activity 4

4.1	$A = P(1 + i)^n$ $12\,146,72 = 10\,000 \left(1 + \frac{i}{12} \right)^{36}$ $\left(1 + \frac{i}{12} \right)^{36} = \frac{12\,146,72}{10\,000}$ $1 + \frac{i}{12} = \left(\frac{12\,146,72}{10\,000} \right)^{\frac{1}{36}}$ $\frac{r}{1\,200} = \left(\frac{12\,146,72}{10\,000} \right)^{\frac{1}{36}} - 1$ $r = 1\,200 \left[\left(\frac{12\,146,72}{10\,000} \right)^{\frac{1}{36}} - 1 \right]$ $r = 6,5\% \text{p.a.}$
4.2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $235\,000 = \frac{x \left[1 - \left(1 + \frac{0,11}{12} \right)^{-54} \right]}{\frac{0,11}{12}}$ $x = \frac{850\,000 \left(\frac{0,11}{12} \right)}{\left[1 - \left(1 + \frac{0,11}{12} \right)^{-54} \right]}$ $x = R5\,536,95$
4.2.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{R5\,536,95 \left[1 - \left(1 + \frac{0,11}{12} \right)^{-12} \right]}{\frac{0,11}{12}}$ $OB = R62\,648,17741$ $\text{Amount paid} = R5\,536,95 \times 12$ $\text{Amount paid} = R66\,443,40$

	$Interest = Amount\ paid - Outstanding\ balance$ $Interest = 66\ 443,40 - 62\ 648,17741$ $Interest = R3\ 795,22$
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Activity 5

5.1.1	$A = P(1 - i)^n$ $A = 150\ 000(1 - 0,2)^2$ $A = R96\ 000$
5.1.2	$A = P(1 - i)^n$ $49\ 152 = 150\ 000(1 - 0,2)^n$ $(0,8)^n = \frac{49\ 152}{150\ 000}$ $n = \frac{\log\left(\frac{49\ 152}{150\ 000}\right)}{\log(0,8)}$ $n = 5\ \text{years}$
5.1.3	$F = \frac{x[(1 + i)^n - 1]}{i}$ $280\ 000 = \frac{x\left[\left(1 + \frac{0,085}{12}\right)^{20} - 1\right]}{\frac{0,085}{12}}$ $x = \frac{280\ 000\left(\frac{0,085}{12}\right)}{\left[\left(1 + \frac{0,085}{12}\right)^{20} - 1\right]}$ $x = R10\ 784,87$
5.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $P = \frac{9\ 000\left[1 - \left(1 + \frac{0,15}{12}\right)^{-180}\right]}{\frac{0,15}{12}}$ $P = R650\ 000$

TUTORIAL 4

Activity 1

1.1	$A = P(1 + i)^n$ $A = 250\,000 \left(1 + \frac{0,15}{12}\right)^2$ $A = R256\,289,06$
1.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $256\,289,06 = \frac{x \left[1 - \left(1 + \frac{0,15}{12}\right)^{-46}\right]}{\frac{0,15}{12}}$ $x = \frac{256\,289,06 \left(\frac{0,15}{12}\right)}{\left[1 - \left(1 + \frac{0,15}{12}\right)^{-46}\right]}$ $x = R7\,359,79$

Activity 2

2.1	$A = P(1 - i)^n$ $A = 255\,000(1 - 0,125)^7$ $A = R100\,137,46$
2.2.1	$A = P(1 + i)^n$ $A = 10\,000 \left(1 + \frac{0,095}{12}\right)^5$ $A = R10\,402,15$
2.2.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $10\,402,15 = \frac{450 \left[1 - \left(1 + \frac{0,095}{12}\right)^{-n}\right]}{\frac{0,095}{12}}$ $1 - \left(\frac{2\,419}{2\,400}\right)^{-n} = \left(\frac{10\,402,15}{450}\right) \left(\frac{0,095}{12}\right)$ $\left(\frac{2\,400}{2\,419}\right)^n = 1 - \left(\frac{10\,402,15}{450}\right) \left(\frac{0,095}{12}\right)$ $\left(\frac{2\,400}{2\,419}\right)^n = 0,8169992112$ $n = \frac{\log(0,8169992112)}{\log\left(\frac{2\,400}{2\,419}\right)}$ $n = 25,63151308$. Therefore, there are 25 payments of full R450 each and a 26th payment which is less than R450. $n = 26$

2.2.3	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{450 \left[1 - \left(1 + \frac{0,095}{12} \right)^{-0,63151308} \right]}{\frac{0,095}{12}}$ $OB = R282,36$
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Activity 3

3.1.1	$r = 10\% \text{p.a.}$
3.1.2	$A = P(1 + i)^n$ $A = 5\,000 \left(1 + \frac{0,1}{4} \right)^4$ $A = R6\,092,01$
3.2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $800\,000 = \frac{10\,000 \left[1 - \left(1 + \frac{0,14}{12} \right)^{-n} \right]}{\frac{0,14}{12}}$ $1 - \left(\frac{607}{600} \right)^{-n} = \left(\frac{800\,000}{10\,000} \right) \left(\frac{0,14}{12} \right)$ $\left(\frac{600}{607} \right)^n = 1 - \left(\frac{800\,000}{10\,000} \right) \left(\frac{0,14}{12} \right)$ $\left(\frac{600}{607} \right)^n = 0,066666667$ $n = \frac{\log(0,066666667)}{\log\left(\frac{600}{607}\right)}$ $n = 233,4699958.$ Therefore, there are 233 payments of full R10 000 each and a 234th payment which is less than R10 000. $n = 234$
3.2.2	(a) $OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $OB = \frac{10\,000 \left[1 - \left(1 + \frac{0,14}{12} \right)^{-185,4699958} \right]}{\frac{0,14}{12}}$ $OB = R757\,429$ (b) $\frac{30}{100} \times \text{Cost price} = R757\,429$ $\text{Cost price} = R2\,254\,764$

Activity 4

4.1	$A = P(1 + i)^n$ $2 = 1(1 + 0,085)^n$ $(1,085)^n = 2$ $n = \log_{(1,085)}(2)$ $n = 8,5$ $n \approx 9 \text{ years}$
4.2.1	$A = P(1 + i)^n$ $A = 350\,000 \left(1 + \frac{0,135}{12}\right)^2$ $A = R357\,919,30$
4.2.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $357\,919,30 = \frac{x \left[1 - \left(1 + \frac{0,135}{12}\right)^{-238}\right]}{\frac{0,135}{12}}$ $x = \frac{357\,919,30 \left(\frac{0,135}{12}\right)}{\left[1 - \left(1 + \frac{0,135}{12}\right)^{-238}\right]}$ $x = R4\,328,60$
4.2.2	$OB = \frac{x[1 - (1 + i)^{-n}]}{i}$ $4\,328,60 \left[1 - \left(1 + \frac{0,135}{12}\right)^{-58}\right]$ $OB = \frac{\frac{0,135}{12}}{\frac{0,135}{12}}$ $OB = R190\,734,30$ <i>SAVINGS = TOTAL REGULAR PAYMENTS – OUTSTANDING BALANCE</i> <i>SAVINGS = (x × n) – OUTSTANDING BALANCE</i> <i>SAVINGS = (4 328,60 × 58) – 190 734,30</i> <i>SAVINGS = R60 324,5</i>

Activity 5

5.1.1	$\text{Total payable} = R400 \times (43 \times 12)$ $\text{Total payable} = R206\,400$
5.1.2	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{400 \left[\left(1 + \frac{0,08}{12}\right)^{516} - 1 \right]}{\frac{0,08}{12}}$ $F = R1\,789\,977,22$ $\text{Interest} = R1\,789\,977,22 - R206\,400$ $\text{Interest} = R1\,583\,577,22$
5.1.3	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $2\,000\,000 = \frac{x \left[1 - \left(1 + \frac{0,1}{12}\right)^{-300} \right]}{\frac{0,135}{12}}$ $x = \frac{2\,000\,000 \left(\frac{0,1}{12} \right)}{\left[1 - \left(1 + \frac{0,1}{12}\right)^{-300} \right]}$ $x = R18\,174,01$

Activity 6

6.1	$A = P(1 - i)^n$ $72\,500 = 145\,000(1 - i)^5$ $(1 - i)^5 = 0,5$ $1 - i = (0,5)^{\frac{1}{5}}$ $i = 1 - (0,5)^{\frac{1}{5}}$ $r = 100 \left[1 - (0,5)^{\frac{1}{5}} \right]$ $r = 29,29\% \text{p.a.}$
6.2.1	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $500\,000 = \frac{x \left[1 - \left(1 + \frac{0,12}{12} \right)^{-240} \right]}{\frac{0,12}{12}}$ $x = \frac{500\,000 \left(\frac{0,12}{12} \right)}{\left[1 - \left(1 + \frac{0,12}{12} \right)^{-240} \right]}$ $x = R5\,505,43$
6.2.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $500\,000 = \frac{6\,000 \left[1 - \left(1 + \frac{0,12}{12} \right)^{-n} \right]}{\frac{0,12}{12}}$ $1 - \left(\frac{101}{100} \right)^{-n} = \left(\frac{500\,000}{10\,000} \right) \left(\frac{0,12}{12} \right)$ $\left(\frac{100}{101} \right)^n = 1 - \left(\frac{500\,000}{6\,000} \right) \left(\frac{0,12}{12} \right)$ $\left(\frac{100}{101} \right)^n = \frac{1}{6}$ $n = \frac{\log\left(\frac{1}{6}\right)}{\log\left(\frac{100}{101}\right)}$ $n = 180,703409. \text{ Therefore, there are 180 payments of full R6 000 each and a } 181^{\text{st}} \text{ payment which is less than R6 000.}$ $n = 181$
6.2.3	Samuel: $R1\,086\,000 - R500\,000 = R586\,000$ Mpume: $R1\,321\,303,20 - R500\,000 = R771\,303,20$ $\therefore$ Mpume paid more interest than Samuel.