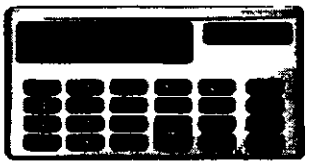
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (459040)
QMG102Q (496724)
QMS102E (494136)
RQG102M (469751)
RQM102G (454870)

May/June 2009

INTRODUCTORY FINANCIAL MATHEMATICS

Duration 2 Hours

100 Marks

EXAMINERS :
FIRST : MRS S ROTHMANN
SECOND : MISS J LE ROUX

Programmable pocket calculator is permissible.

This paper consists of 17 pages including a list of formulæ, a table with the number of each day of the year and four sheets of paper for rough work, plus instructions for completing a mark-reading sheet.

Please complete the attendance register on the back page, tear it off and hand it to the invigilator.

Answer *all* questions on the mark-reading sheet supplied Carefully follow the instructions for completing the mark-reading sheet. Also pay attention to the following:

- Only one option (indicated as [1] [2] [3] [4] [5]) per question is correct Do not mark more than one option per question on the mark-reading sheet.
- Marks will *not* be deducted for incorrect answers
- There are 30 questions for a total of 100 marks.

You are strongly advised to write your name on the mark-reading sheet. Then, if you have entered your student number incorrectly, we will still be able to link you to the mark-reading sheet.

Question 1

An amount of R4 317,26 was borrowed on 5 May at a simple interest rate of 15% per year. The loan will be worth R4 500 on

[1] 12 August.
[2] 16 August.
[3] 21 August.
[4] 9 October.
[5] none of the above.

Question 2

Lucia wants to buy a television set for R3 500 and borrows the money from the bank at a discount rate of 13% per year. The amount that Lucia will pay the bank in 10 months' time equals

[1] R3 120,83.
[2] R3 142,48.
[3] R3 879,17.
[4] R3 898,20.
[5] R3 925,23.

Question 3

A simple interest rate of 18,58% over a time period of 63 days is equivalent to a simple discount rate of

[1] 18,00%.
[2] 18,02%.
[3] 18,58%.
[4] 19,20%.
[5] none of the above.

Question 4

A continuous compounding rate of 12,57% is equivalent to a nominal rate, per year, compounded quarterly, of

[1] 12,02%.
[2] 12,38%.
[3] 12,57%.
[4] 12,77%.
[5] 13,18%.

Question 5

Mary invested R40 000 in order to have R56 000 available in 30 months' time. The yearly rate, compounded semi-annually, equals

[1] 7,205%.
[2] 8%.
[3] 13,92%.
[4] 14,41%.
[5] 16%.

Question 6

An interest rate of 14,9% per year, compounded quarterly, is equivalent to a weekly compounded interest rate of

[1] 14,65%.
[2] 14,88%.
[3] 15,16%.
[4] 19,02%.
[5] none of the above.

Question 7

A continuous compounding rate of 11,8% is equivalent to an effective rate of

[1] 11,15%.
[2] 11,8%.
[3] 12,52%.
[4] 43,06%.
[5] none of the above.

Question 8

Tito bought a stamp collection for R140 000. For 10 years the value of the collection increased yearly by 28%. Thereafter the value increased yearly by 5%. The amount of money that Tito can expect to receive if he sells his collection after owning it for 19 years equals approximately

[1] R353 773.
[2] R739 200
[3] R771 400.
[4] R1 017 800.
[5] R2 564 079.

Questions 9 and 10 relate to the following situation:
Three years ago Raphael borrowed R10 000 from Pinky on the condition that he should pay her back two years from now. *He will also pay her R6 000 five years from* now. *The applicable interest rate for both transactions is 13,75% per year, compounded half yearly.*

Question 9

The amount of money that Raphael will owe Pinky two years from *now* equals

[1] R16 000,00.
[2] R17 988,38.
[3] R18 928,61.
[4] R22 528,86.
[5] R23 469,10.

Question 10

After seeing what he owes Pinky, Raphael asks Pinky if he can pay her R9 000 *now* and the rest in four years' time. She agrees on the condition that the new agreement will run from *now* and that an interest rate of 16,28% per year, compounded monthly, will be applicable from *now*. The amount that Raphael will have to pay Pinky four years from *now* equals

[1] R8 988,38.
[2] R13 366,24.
[3] R15 245,21.
[4] R17 162,98.
[5] R23 430,38.

Question 11

The MIRR for a project lasting 11 years is 9,9%. The present value of the cash outflows equals R164 100. The future value of the cash inflows equals approximately

[1] R52 129.
[2] R58 094.
[3] R146 925.
[4] R463 535.
[5] R1 657 576.

Question 12

Manto is considering buying a baby-food factory She can borrow money at 22,4% interest per year to cover the following cash outflows

Years	Cash outflows R
4	500 000
6	250 000
8	150 000
9	700 000

The present value of the cash outflows equals approximately

[1] R440 401

[2] R1 186 098.

[3] R1 600 000.

[4] R2 175 028.

[5] none of the above.

Question 13

A loan of x rand is to be repaid in 25 payments The first 15 payments are R2 000 each, paid at the beginning of each month. Thereafter the payments are R4 000 each per month, paid at the end of each month The present value of this loan can be denoted by the equation

[1] $x = (1+i)6\,000a_{\overline{25}|i}$

[2] $x = 2\,000a_{\overline{15}|i} + 4\,000a_{\overline{10}|i}$.

[3] $x = (1+i)2\,000a_{\overline{15}|i} + 4\,000a_{\overline{10}|i}$.

[4] $x = (1+i)2\,000a_{\overline{15}|i} + 4\,000a_{\overline{10}|i}(1+i)^{-15}$.

[5] $x = (1+i)2\,000s_{\overline{15}|i} + 4\,000s_{\overline{10}|i}$.

Question 14

A loan is repaid in 20 monthly payments. The first 12 payments will be R3 000 each, paid at the end of each month Thereafter the payments will be R6 000 each per month, paid at the beginning of each month. An interest rate of 19,6% per year, compounded monthly, is applicable. The present value of this loan equals

[1] R32 452,37

[2] R69 818,64.

[3] R77 108,15.

[4] R77 837,53.

[5] R84 000,00.

Questions 15, 16 and 17 relate to the following situation:
The following table is an extract from the amortisation schedule for Denver's home loan over a 20-year period:

Month	*Outstanding principal at beginning of the month*	*Interest due at month end*	*Payment*	*Principal repaid*	*Outstanding principal at month end*
201	*503 033,57*	*6 036,40*	*15 908,46*	*9 872,06*	*493 161,51*
202		*5 917,94*	*15 908,46*		*A*

Question 15

The applicable nominal interest rate, compounded monthly, equals

[1] 14,4%.
[2] 14,69%.
[3] 26,35%.
[4] 31,6%.
[5] 37,95%.

Question 16

The value of A equals

[1] R477 253,05.
[2] R483 170,99.
[3] R487 243,59.
[4] R493 043,03.
[5] none of the above.

Question 17

The size of the loan equals approximately

[1] R720 539.
[2] R1 229 457.
[3] R1 250 000.
[4] R1 518 018.
[5] R3 818 030.

Question 18

Salomey took out an endowment policy The first annual payment was Rx, whereafter it increased yearly by R1 700 After 20 years the policy paid out R1 005 962 The applicable yearly interest rate is 10% The value of x equals approximately

[1] R564.
[2] R6 500
[3] R11 816.
[4] R17 564.
[5] R23 500

Question 19

The following is the price equation for Stock 733:

$$96{,}80770 = 7{,}5a_{\overline{15}|i} + 32{,}09888$$

The yearly yield to maturity equals

[1] 7,87%.
[2] 15,74%.
[3] 16,55%.
[4] 19,39%.
[5] 21,6%.

Question 20

If the NPV of the Calm and Relax Spa is R195 000 and the profitability index is 1,24375, the initial investment in the Spa equals

[1] R86 908.
[2] R156 784.
[3] R195 000.
[4] R242 531.
[5] none of the above

Question 21

Consider Stock XX

Coupon rate:	12,6% per year
Yield to maturity:	9,5% per year
Settlement date:	9 May 2009
Maturity date.	29 September 2015

The all-in-price equals

[1] R109,89791%.

[2] R112,76174%.

[3] R113,93381%

[4] R115,97474%.

[5] R120,23381%.

Question 22

If the modified internal rate of return (MIRR), the future value of all positive cash flows C, and the present value of all negative cash flows PV_{out}, are given, then the duration of the project in years can be expressed as

[1] $n = \frac{\ln(\text{MIRR}+1)}{\ln\left(\frac{C}{\text{PV}_{\text{out}}}\right)}$

[2] $n = \frac{\ln\left(\frac{C}{\text{PV}_{\text{out}}}\right)}{\ln(\text{MIRR}+1)}$.

[3] $n = \frac{\frac{C}{\text{PV}_{\text{out}}}}{\text{MIRR}+1}$.

[4] $n = \frac{\frac{C}{\text{PV}_{\text{out}}-1}}{\text{MIRR}}$

[5] $n = \frac{C}{\text{PV}_{\text{out}}} - (\text{MIRR}+1)$.

Question 23

The coefficient of .... represents the part of the variation in the dependent variable that can be explained by the independent variable. The missing word is

[1] correlation

[2] determination.

[3] deviation.

[4] regression.

[5] variance.

Questions 24 and 25 relate to the following situation:
The following table represents the number of cars sold (y) by Quick Cars and the average interest rate (x) over the corresponding time period

Average interest rate x	*Number of cars sold* y
10	*1 500*
11	*1 200*
11,5	*1 150*
12,0	*1 000*
14,0	*500*
14,5	*120*
15,0	*120*

Question 24

Assume that there is a linear relationship between the average interest rate and the number of cars sold over the corresponding period. The slope of the regression line equals

[1] −0,99.
[2] 1,78.
[3] 1,92.
[4] 12,57.
[5] none of the above

Question 25

The correlation coefficient of the regression line equals

[1] −0,99.
[2] 1,78.
[3] 1,92.
[4] 12,57.
[5] none of the above.

Question 26

The equation for the present value of Stock OPE on 24/6/2009 is given by

$$P(24/6/2009) = 7{,}35a_{\overline{29}|0{,}135\div 2} + 100\left(1+\frac{0{,}135}{2}\right)^{-29}$$

and the fraction of the half year to be discounted back is 74/181 The accrued interest equals R4,30932% The clean price for Stock OPE equals

[1] R107,56456%.

[2] R109,02688%.

[3] R111,87388%.

[4] R114,90174%.

[5] none of the above.

Question 27

The Three Wheel Fund has set aside an amount of R1 500 000 for Johny Oneleg, to be paid out to him in whatever way he pleases. He wants to receive three equal payments: one *now*, one four years from *now*, and one eight years from *now*. If an interest rate of 19% per year, compounded quarterly, is applicable, then the amount of money that Johny Oneleg will receive four years from *now*, equals approximately

[1] R284 091.

[2] R419 333

[3] R500 000.

[4] R881 097.

[5] R1 222 990.

Question 28

Tyron bought a house for R1 450 000. He managed to secure a loan for 80% of the value of the house. His monthly payments are R15 274,76 at a fixed rate of 15% per year, compounded monthly over a period of 20 years. If an average yearly inflation rate of 12,95% is expected, then the real cost of the loan will equal approximately

[1] R142 247

[2] R147 753

[3] R1 307 753.

[4] R2 215 942.

[5] R2 505 942

Questions 29 and 30 relate to the following situation:
Lilian will discharge a debt of R850 000 eight years from now, *using the sinking fund method. The debt's interest is 14,8% per year, compounded monthly The sinking fund will earn 12,6% per year, compounded quarterly*

Question 29

The quarterly deposit into the sinking fund will equal

[1] R4 672,05.
[2] R15 155,38.
[3] R15 770,08.
[4] R26 562,50.
[5] R42 544,09.

Question 30

The total yearly cost to discharge the debt (to the nearest rand) will equal

[1] R105 012.
[2] R188 880.
[3] R212 500
[4] R231 173.
[5] R315 040.

The number of each day of the year

FOR LEAP YEARS ADD ONE TO THE NUMBER OF EVERY DAY AFTER FEBRUARY 28

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	**1**
2	2	33	61	92	122	153	183	214	245	275	306	336	**2**
3	3	34	62	93	123	154	184	215	246	276	307	337	**3**
4	4	35	63	94	124	155	185	216	247	277	308	338	**4**
5	5	36	64	95	125	156	186	217	248	278	309	339	**5**
6	6	37	65	96	126	157	187	218	249	279	310	340	**6**
7	7	38	66	97	127	158	188	219	250	280	311	341	**7**
8	8	39	67	98	128	159	189	220	251	281	312	342	**8**
9	9	40	68	99	129	160	190	221	252	282	313	343	**9**
10	10	41	69	100	130	161	191	222	253	283	314	344	**10**
11	11	42	70	101	131	162	192	223	254	284	315	345	**11**
12	12	43	71	102	132	163	193	224	255	285	316	346	**12**
13	13	44	72	103	133	164	194	225	256	286	317	347	**13**
14	14	45	73	104	134	165	195	226	257	287	318	348	**14**
15	15	46	74	105	135	166	196	227	258	288	319	349	**15**
16	16	47	75	106	136	167	197	228	259	289	320	350	**16**
17	17	48	76	107	137	168	198	229	260	290	321	351	**17**
18	18	49	77	108	138	169	199	230	261	291	322	352	**18**
19	19	50	78	109	139	170	200	231	262	292	323	353	**19**
20	20	51	79	110	140	171	201	232	263	293	324	354	**20**
21	21	52	80	111	141	172	202	233	264	294	325	355	**21**
22	22	53	81	112	142	173	203	234	265	295	326	356	**22**
23	23	54	82	113	143	174	204	235	266	296	327	357	**23**
24	24	55	83	114	144	175	205	236	267	297	328	358	**24**
25	25	56	84	115	145	176	206	237	268	298	329	359	**25**
26	26	57	85	116	146	177	207	238	269	299	330	360	**26**
27	27	58	86	117	147	178	208	239	270	300	331	361	**27**
28	28	59	87	118	148	179	209	240	271	301	332	362	**28**
29	29		88	119	149	180	210	241	272	302	333	363	**29**
30	30		89	120	150	181	211	242	273	303	334	364	**30**
31	31		90		151		212	243		304		365	**31**

FORMULÆ

$$I = Prt$$

$$S = P(1+rt)$$

$$P = S(1-dt)$$

$$S = P\left(1+\frac{j_m}{m}\right)^{tm}$$

$$j_{eff} = 100\left(\left(1+\frac{j_m}{m}\right)^{m}-1\right)$$

$$S = Pe^{ct}$$

$$j_\infty = 100(e^c - 1)$$

$$c = m\ln\left(1+\frac{j_m}{m}\right)$$

$$j_m = m\left(e^{\frac{c}{m}}-1\right)$$

$$i = n\left(\left(1+\frac{j_m}{m}\right)^{\frac{m}{n}}-1\right)$$

$$S = R\left(\frac{(1+i)^n-1}{i}\right)$$

$$S = Rs_{\overline{n}|i}$$

$$P = Ra_{\overline{n}|i}$$

$$P = R\left(\frac{(1+i)^n-1}{i(1+i)^n}\right)$$

$$A = nR + Q\left[\frac{n(n-1)}{2}\right]$$

$$r = \frac{d}{1-dt}$$

$$S = (1+i)Rs_{\overline{n}|i}$$

$$P = (1+i)Ra_{\overline{n}|i}$$

$$P = da_{\overline{n}|z} + 100(1+z)^{-n}$$

$$\frac{H-R}{365}\times c$$

$$\frac{-R}{365}\times c$$

$$MIRR = \left(\frac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$$

$$P = \frac{R}{i}$$

$$S = \left[R+\frac{Q}{i}\right]s_{\overline{n}|i} - \frac{nQ}{i}$$

$$T_r = Ra_{\overline{n}|r}$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$\bar{x}_w = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$S = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$$

DSC1630
MAY/JUNE 2009
SOLUTIONS

QUESTION 1

$S = P(1+rt)$ $\therefore 4\,500 = 4317.26(1+0.15t)$. $\therefore t = 103$ days. From the table, 5 May is the 125th day of the year. $\therefore$ $103+125 = 228^{th}$ day of the year which is 16 August. **[2]**

QUESTION 2

$P = S(1-dt)$. $\therefore 3500 = S\left(1-0.13\times\frac{10}{12}\right)$. $\therefore S = \text{R}3\,925.23$ **[5]**

QUESTION 3

$r = \frac{d}{1-dt}$. $\therefore d = \frac{r}{rt+1} = \frac{0.1858}{0.1858\times\frac{63}{365}+1} = 0.180027 = 18\%$ **[1]**

QUESTION 4

$\left(1+\frac{i}{4}\right)^4 = e^{0.1257}$ $\therefore 1+\frac{i}{4} = e^{0.1257/4}$ $\therefore i = 12.77\%$ **[4]**

QUESTION 5

PV = ±40 000, FV = 56 000, N = 5, COMP 1 × 2. **[3]**

QUESTION 6

PV = ±100, N = 4, $I = \frac{14.9}{4}$, COMP FV, N = 52, COMP I × 2 **[1]**

QUESTION 7

$1+i_{eff} = e^{0.118}$ $\therefore i_{eff} = 12.52\%$ **[3]**

QUESTION 8

PV = ±140 000, N = 10, I = 28, COMP FV. FV after 10 years = R1 652 828.27
PV = ±1 652 828.27, N = 9, I = 5, COMP FV **[5]**

QUESTION 9

(a) PV = ±10 000, N = 10, $I = \frac{13.75}{2}$, COMP FV, FV = R19 442.91---------(1)

(b) FV = 6 000, N = 6, $I = \frac{13.75}{2}$, COMP PV, PV = R4 026.19----------(2)

(1) + (2) = R23 469.10 **[5]**

QUESTION 10

Raphael pays Pinky 4 years from now

$$= 23\,469.10\left(1+\frac{0.1628}{12}\right)^{24} - 9\,000\left(1+\frac{0.1628}{12}\right)^{48} = \text{R15 245.21 } \textbf{[3]}$$

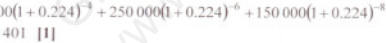
QUESTION 11

PV = ±164 000, N = 11, I = 9.9, COMP FV **[4]**

QUESTION 12

$$\text{PV} = 500\,000(1+0.224)^{-4} + 250\,000(1+0.224)^{-6} + 150\,000(1+0.224)^{-8} + 700\,000(1+0.224)^{-9}$$
$$= \text{R440 401 } \textbf{[1]}$$

QUESTION 13



$$x = (1+i)2\,000a_{\overline{15}|i} + 4\,000a_{\overline{10}|i}(1+i)^{-15}$$

QUESTION 14

The first timeline shows payments made at the end of each month. In the second timeline the first payment is made at the beginning of the 13th month and the last payment is made at the beginning of the 20th month.

The PV of the payments made at the end of each month = $3\,000\left(1+\frac{0.196}{12}\right)^{-12}$ = R32 452.37

The PV at the beginning of the 13th month of all the payments made at the beginning of each month = $\left(1+\frac{0.196}{12}\right)6\,000a_{8\neg\,0.196/12}$ = R45 385.16. We now determine the present value of this amount at the beginning of the term. Thus PV = $R45\,385.16\left(1+\frac{0.196}{12}\right)^{-12}$ = R37 366.28

Hence PV of the loan = R32 452.37+R37 366.28 = R69 818.65 **[2]**

QUESTION 15

Interest rate per month = $\frac{6\,036.40}{503\,033.57}\times 100$ = 1.2% = 14.4% per annum

QUESTION 16

A = 493 161.53 – (15 908.46 – 5 917.94) = R483 170.99

QUESTION 17

PMT = ±15 908.46, N = 240, I = $\frac{14.4}{12}$, COMP PV. **[3]**

QUESTION 18

$1\,005\,962=\left(x+\frac{1\,700}{0.1}\right)s_{20\neg\,0.1}-\frac{20\times 1\,700}{0.1}$ $\therefore x = 6\,500$ approximately **[2]**

QUESTION 19

$7.5a_{15\neg\,i}$ = 96.80770 – 32.09888 = 64.70882
PV = 64.60882, PMT = ±7.5, N = 15, (COMP I) ×2 **[2]**

QUESTION 20

$$\text{PI} = \frac{\text{NPV} + \text{Initial investment}}{\text{Initial investment}} \text{ i.e. } 1.24375 = \frac{195\,000 + \text{Initial investment}}{\text{Initial investment}}$$

$\therefore$ Initial investment = 800 000 **[5]**

QUESTION 21

29 March 2009 — 9 May 2009 — 29 September 2009 (0) — 29 September 2015 (12)

$P(29\text{ Sep }2009) = 6.3a_{\overline{12}|4.75} + 100\left(1+\frac{4.75}{100}\right)^{-12} = \text{R}113.93381\%$. Since the first coupon date and the settlement date are more than 10 days apart, we add the value of the coupon to this price. Hence price = R120.23381. Also the number of days between 9 May 2009 and 29 September 2009 is 143. Hence all-in-price $= 120.23381\left(1+\frac{4.75}{100}\right)^{\frac{143}{184}} = \text{R}115.97474\%$ **[4]**

QUESTION 22

$C = \text{PV}_{\text{out}}(1+\text{MIRR})^n \therefore \frac{C}{\text{PV}_{\text{out}}} = (1+\text{MIRR})^n$. Taking the natural log on both sides we get

$\ln\frac{C}{\text{PV}_{\text{out}}} = n\ln(1+\text{MIRR})$. Solving for n gives

$$n = \frac{\ln\left(\frac{C}{\text{PV}_{\text{out}}}\right)}{\ln(1+\text{MIRR})} \quad \textbf{[2]}$$

QUESTION 23
[2]

QUESTION 24

10, (*x*, *y*), 1 500, ENT
. . . .
. . . .
. . . .
15, (*x*, *y*), 120, ENT

RCL *b* **[5]**

QUESTION 25

RCL r **[1]**

QUESTION 26

(a) PMT = ±7.35, N = 29, $I = \frac{13.5}{2}$, COMP PV. PV = 92.50885-------- (1)

(b) FV = 100, N = 29, $I = \frac{13.5}{2}$, COMP PV. PV = 15.04289---------- (2)

$\therefore$ P(24 June 2009) = (1) + (2) = R107.55174

Since the settlement date and the first coupon date are more than 10 days apart, add the value of the coupon to the above price. Hence all-in-price on 24 June 2009 is R114.90174%.

$\therefore$ Clean Price = all-in-price – accrued interest
= 114.90174 – 4.30932 = R110.59242% **[5]**

QUESTION 27

$x + x\left(1+\frac{0.19}{4}\right)^{-16} + x\left(1+\frac{0.19}{4}\right)^{-32} = 1\,500\,000, \therefore x = 881\,097$ **[4]**

QUESTION 28

Loan = $0.80 \times 1\,450\,000 = 1\,160\,000$

PMT = ±15 274.76, $I = \frac{12.95}{12}$, N = 24, COMP PV. PV = 1 307 753

Hence real cost of loan = 1 307 753 – 1 160 000 = R147 753 **[2]**

QUESTION 29

FV = 850 000, N = 32, $I = \frac{12.6}{4}$, COMP PMT **[3]**

QUESTION 30

Yearly cost = Monthly interest $\times \frac{12}{12}$ + quarterly payments $\times$ 4

$= \frac{14.8}{100} \times 850\,000 + 15\,770.08 \times 4 = R188\,880$

UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (468829) October/November 2009
RDS1630 (491491)

INTRODUCTORY FINANCIAL MATHEMATICS

Duration 2 Hours 100 Marks

EXAMINERS
FIRST MRS S ROTHMANN
SECOND MISS J LE ROUX

Programmable pocket calculator is permissible

This paper consists of 17 pages including a list of formulae a table containing the number of each day of the year and four sheets of paper for rough work plus instructions for completing a mark-reading sheet

Please complete the attendance register on the back page, tear it off and hand it to the invigilator.

Answer *all* questions on the mark-reading sheet supplied Carefully follow the instructions for completing the mark-reading sheet Also pay attention to the following

- Only one option (indicated as [1] [2] [3] [4] [5]) per question is correct Do not mark more than one option per question on the mark-reading sheet
- Marks will *not* be deducted for incorrect answers
- There are 80 questions for a total of 100 marks

You are strongly advised to write your name on the mark-reading sheet Then, if you have entered your student number incorrectly we will still be able to link you to the mark-reading sheet

Question 1

Cyril invested R25 000 on 2 March. It will accumulate to R26 716,85 on 29 December of the same year. The applicable simple interest rate is

[1] 7,74%
[2] 7,77%
[3] 8,03%
[4] 8,24%
[5] 8,30%

Question 2

The simple interest rate that is equivalent to a discount rate of 9,5% over a period of 275 days equals

[1] 2,34%
[2] 8,87%
[3] 9,50%
[4] 10,23%
[5] 16,66%

Question 3

Gideon has to pay Gillian R27 000 twenty-five months from *now*. He decides to pay her back earlier. If a simple interest rate of 9,4% per year is applicable, then the amount that Gillian will receive from Gideon 12 months from *now* will equal

[1] R22 578,40
[2] R24 504,61
[3] R24 680,07
[4] R24 700,77
[5] R24 877,68

Question 4

If R17 500 accumulates to R22 000 at a continuous compounding rate of 5,181% per year, then the time under consideration equals approximately

[1] 44 months
[2] 45 months
[3] 53 months
[4] 54 months
[5] 60 months

Question 5

An effective interest rate of 17,35% is equivalent to a continuous compounding rate of

[1] 16 0%
[2] 16,11%
[3] 18 80%
[4] 18 95%
[5] none of the above

Question 6

Vicky invested R15 000 in an account earning interest at 10 25% per year compounded every four months The amount of interest that she can expect to earn after four years will equal

[1] R2 050 00
[2] R4 612,50
[3] R6 150 00
[4] R7 448 00
[5] R7 485 83

Question 7

Dieter owes Paul R3 000 due 10 months from *now* and R25 000 due 32 months from *now* Dieter asks Paul if he can discharge his obligations by two equal payments one *now* and the other one 28 months from *now* Paul agrees on condition that a 14 75% interest rate compounded every two months is applicable The amount that Dieter will pay Paul 28 months from *now* will equal approximately

[1] R11 455
[2] R11 511
[3] R11 907
[4] R14 000
[5] R20 000

Question 8

Pinky invested R18 000 in a special savings account on 6 March 2008 and will leave it there until 29 November 2009. Interest is credited on the first day of every month at 9,35% per year compounded monthly. Simple interest is used for odd periods and compound interest for full periods. When fractional compounding is used, the accumulated amount on 29 November 2009 will equal

[1] R20 918,74

[2] R21 146,40

[3] R21 149,56

[4] R21 151,80

[5] R21 155,40

Question 9

If the modified internal rate of return (MIRR) of a project, the future value of all positive cash flows (C) and the present value of all negative cash flows (PV_{out}) are given, then the duration of the project (n) in years can be expressed as

[1] $n = \frac{C}{\frac{\text{PV}_{\text{out}}}{\text{MIRR}+1}}$

[2] $n = \frac{\text{MIRR}-1}{\frac{C}{\text{PV}_{\text{out}}}}$

[3] $n = \frac{\ln\left(\frac{C}{\text{PV}_{\text{out}}}\right)}{\ln(\text{MIRR}+1)}$

[4] $n = \frac{\ln(\text{MIRR}+1)}{\ln\left(\frac{C}{\text{PV}_{\text{out}}}\right)}$

[5] $n = \frac{\ln(\text{MIRR}-1)}{\ln\left(\frac{C}{\text{PV}_{\text{out}}}\right)}$

Question 10

The coefficient of _____ represents the part of the variation in the dependent variable that can be explained by the independent variable.

[1] correlation

[2] determination

[3] regression

[4] relation

[5] summation

Questions 11 and 12 relate to the following situation
Mandla won the "Play ball" game worth R2 500 000 in prize money. He may choose how the money should be paid out.

Question 11

Assume the money can be invested at 10,75% per year, compounded monthly. If Mandla chooses to be paid a fixed amount every month for an indefinite period, then the amount he will receive from his winnings every month will amount to

[1] R19 379,84
[2] R23 255,81
[3] R25 000,00
[4] R27 906,98
[5] none of the above

Question 12

However, Mandla chooses to receive two payments: one payment five years from *now* and one payment three times the size of the first payment ten years from *now*. His money is worth 12,6% per year, compounded quarterly. The amount that Mandla will receive five years from *now* equals approximately

[1] R625 000
[2] R956 616
[3] R1 162 157
[4] R1 778 780
[5] R2 160 973

Question 13

The future value of an annuity is R3 673 377,79. The term of the annuity is 20 years. The applicable interest rate is 9% per year, compounded monthly. The present value of this annuity equals

[1] R5 500,00
[2] R33 050,33
[3] R71 801,59
[4] R183 668,89
[5] R611 297,25

Questions 14 and 15 relate to the following situation
Consider Stock MOKSE

Coupon rate	*9.75% per year*
Yield to maturity	*11.4% per year*
Maturity date	*15 April 2035*
Settlement date	*29 November 2009*
Accrued interest	*R1.20205%*

Question 14

The all-in price equals

[1] R82.89925%
[2] R86.43169%
[3] R87.57501%
[4] R87.59499%
[5] R91.30669%

Question 15

The clean price equals

[1] R81.69720%
[2] R85.22964%
[3] R86.37296%
[4] R86.39294%
[5] R88.77706%

Question 16

Eva wants to go overseas and estimates that she will need R35 000 for her trip. She decides to save for this trip by depositing an amount of R500 once a month into an account earning 11,32% interest per year compounded monthly. The approximate time it will take Eva to have R35 000 available for her trip equals

[1] 40 months
[2] 54 months
[3] 70 months
[4] 115 months
[5] none of the above

Question 17

The following table represents the annual income (after tax) of an investment

Years	After-tax income R
1	200 000
2	500 000
3	300 000
4	400 000
5	700 000
6	300 000

If the average rate of return is 8,421% then the original investment (rounded off to the nearest thousand rand) was

[1] R40 000
[2] R1 497 000
[3] R2 400 000
[4] R4 750 000
[5] none of the above

Question 18

The following table represents the expected cashflows from the Helipad Company. The applicable interest rate is 10,5% per year.

Year	Cash flows (R)
2	−200 000
4	+600 000
5	−800 000
6	−950 000
7	+700 000

The present value of the cash outflows equals

[1] R1 171 251,83
[2] R1 411 123,24
[3] R1 559 301,18
[4] R1 950 000,00
[5] none of the above

Questions 19, 20 and 21 relate to the following situation.
David bought a house. After having made a down payment of 25% of the house price, he managed to secure a home loan for the remaining R975 000. The interest rate on the loan is 11,5% per year compounded monthly. The period of the loan is 20 years. His monthly payments are R10 397,69.

Question 19

The down payment equals

[1] R112 125
[2] R126 695
[3] R243 750
[4] R325 000
[5] none of the above

Question 20

After 15 years, his equity equals

[1] R472 781,14
[2] R502 218,86
[3] R565 068,54
[4] R827 218,86
[5] R890 068,54

Question 21

The amount of interest paid by David after 15 years equals

[1] R896 584,20
[2] R981 515,66
[3] R1 044 365,34
[4] R1 369 365,34
[5] none of the above

Questions 22 and 23 relate to the following situation.
Dora will discharge a debt of R560 000 seven years from now using the sinking fund method. The debt's interest rate is 17,9% per year, compounded monthly. The sinking fund will earn interest at a rate of 13,45% per year, compounded quarterly.

Question 22

The quarterly deposit in the sinking fund will equal

[1] R11 737,19
[2] R12 352,12
[3] R13 535,42
[4] R20 000,00
[5] R31 182,12

Question 23

The total yearly cost to discharge the debt (rounded off to the nearest hundred rand) will equal

[1] R49 400
[2] R80 000
[3] R100 200
[4] R140 800
[5] R149 600

Question 24

Cindy bought a house and managed to secure a home loan for R790 000 with monthly payments of R9 680,70 at a fixed interest rate of 13,75% per year, compounded monthly, over a period of 20 years. If an average yearly inflation rate of 9,2% is expected, then the real cost of the loan (the difference between the total value of the loan and the actual principal borrowed) equals

[1] R87 126
[2] R201 642
[3] R270 749
[4] R588 358
[5] R1 060 749

Questions 25 and 26 relate to the following situation
Jay's grandfather lent him R420 000 to open his Nice and Tasty shop. Jay told his grandfather that he would only be able to start paying him back after five years. Grandfather agreed on condition that the loan would earn 12,5% interest per year, compounded monthly.

Question 25

The amount that Jay owes his grandfather when he starts paying him back equals

[1] R420 000,00
[2] R682 500,00
[3] R756 853,64
[4] R782 130,76
[5] R1 002 977,97

Question 26

After the five years, Jay asked his grandfather if he could pay him back over a seven-year period. His grandfather agreed on condition that the applicable interest rate then became 13,8% per year, compounded quarterly. The amount that Jay will now pay his grandfather every three months will equal

[1] R15 000,00
[2] R17 024,72
[3] R22 895,88
[4] R44 008,24
[5] R58 873,90

Question 27

Romeo decides that he would like to buy his lovely wife Juliette a new car when she turns 40 in six years' time. He *immediately* starts depositing R6 000 each month into an account earning 8,94% interest per year, compounded monthly. The amount that Romeo will have available six years from *now* will equal

[1] R333 412
[2] R335 896
[3] R432 000
[4] R568 948
[5] R573 187

Question 28

The present value of payments of R1 100 per month for eight years at an interest rate of 12 9% per year compounded quarterly equals approximately

[1] R21 756
[2] R60 076
[3] R65 666
[4] R105 600
[5] none of the above

Questions 29 and 30 relate to the following situation
An estate agent suspects that a linear relationship exists between the number of houses sold and the monthly loan payments. He analyses the following data over the past five months

Monthly loan payments in R1 000 s x	*Number of houses sold* y
3 7	*16*
5 6	*25*
7 5	*80*
18 9	*45*
28 4	*12*

Question 29

The slope of the regression line is

[1] −0 65747
[2] −0 24810
[3] −0 09362
[4] 10 52744
[5] 44 02872

Question 30

The correlation coefficient equals

[1] −0 65747
[2] −0 24810
[3] −0 09362
[4] +1 39972
[5] none of the above

The number of each day of the year

FOR LEAP YEARS ADD ONE TO THE NUMBER OF EVERY DAY AFTER FEBRUARY 28

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	**1**
2	2	33	61	92	122	153	183	214	245	275	306	336	**2**
3	3	34	62	93	123	154	184	215	246	276	307	337	**3**
4	4	35	63	94	124	155	185	216	247	277	308	338	**4**
5	5	36	64	95	125	156	186	217	248	278	309	339	**5**
6	6	37	65	96	126	157	187	218	249	279	310	340	**6**
7	7	38	66	97	127	158	188	219	250	280	311	341	**7**
8	8	39	67	98	128	159	189	220	251	281	312	342	**8**
9	9	40	68	99	129	160	190	221	252	282	313	343	**9**
10	10	41	69	100	130	161	191	222	253	283	314	344	**10**
11	11	42	70	101	131	162	192	223	254	284	315	345	**11**
12	12	43	71	102	132	163	193	224	255	285	316	346	**12**
13	13	44	72	103	133	164	194	225	256	286	317	347	**13**
14	14	45	73	104	134	165	195	226	257	287	318	348	**14**
15	15	46	74	105	135	166	196	227	258	288	319	349	**15**
16	16	47	75	106	136	167	197	228	259	289	320	350	**16**
17	17	48	76	107	137	168	198	229	260	290	321	351	**17**
18	18	49	77	108	138	169	199	230	261	291	322	352	**18**
19	19	50	78	109	139	170	200	231	262	292	323	353	**19**
20	20	51	79	110	140	171	201	232	263	293	324	354	**20**
21	21	52	80	111	141	172	202	233	264	294	325	355	**21**
22	22	53	81	112	142	173	203	234	265	295	326	356	**22**
23	23	54	82	113	143	174	204	235	266	296	327	357	**23**
24	24	55	83	114	144	175	205	236	267	297	328	358	**24**
25	25	56	84	115	145	176	206	237	268	298	329	359	**25**
26	26	57	85	116	146	177	207	238	269	299	330	360	**26**
27	27	58	86	117	147	178	208	239	270	300	331	361	**27**
28	28	59	87	118	148	179	209	240	271	301	332	362	**28**
29	29		88	119	149	180	210	241	272	302	333	363	**29**
30	30		89	120	150	181	211	242	273	303	334	364	**30**
31	31		90		151		212	243		304		365	**31**

FORMULÆ

$$I = Prt$$

$$S = P(1 + rt)$$

$$P = S(1 - dt)$$

$$S = P\left(1 + \frac{j_m}{m}\right)^{tm}$$

$$j_{eff} = 100\left(\left(1 + \frac{j_m}{m}\right)^{m} - 1\right)$$

$$S = Pe^{ct}$$

$$j_\infty = 100(e^c - 1)$$

$$c = m\ln\left(1 + \frac{j_m}{m}\right)$$

$$j_m = m\left(e^{\frac{c}{m}} - 1\right)$$

$$r = n\left(\left(1 + \frac{j_m}{m}\right)^{\frac{m}{n}} - 1\right)$$

$$S = R\left(\frac{(1+i)^n - 1}{i}\right)$$

$$S = Rs_{\overline{n}|i}$$

$$P = Ra_{\overline{n}|i}$$

$$P = R\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$$

$$A = nR + Q\left[\frac{n(n-1)}{2}\right]$$

$$r = \frac{d}{1 - dt}$$

$$S = (1+i)Rs_{\overline{n}|i}$$

$$P = (1+i)Ra_{\overline{n}|i}$$

$$P = da_{\overline{n}|z} + 100(1+z)^{-n}$$

$$\frac{H - R}{365} \times c$$

$$\frac{-R}{365} \times c$$

$$MIRR = \left(\frac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$$

$$P = \frac{R}{i}$$

$$S = \left[R + \frac{Q}{i}\right]s_{\overline{n}|i} - \frac{nQ}{i}$$

$$T_r = Ra_{\overline{n}|r} - P$$

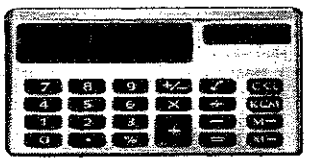
$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$\bar{x}_w = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$S = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (495737)
RDS1630 (461166)

May/June 2010

INTRODUCTORY FINANCIAL MATHEMATICS

Duration : 2 Hours

100 Marks

EXAMINERS :
FIRST : MRS S ROTHMANN
SECOND : MISS J LE ROUX

Programmable pocket calculator is permissible.

This paper consists of 25 pages including a list of formulæ, a table with the number of each day of the year and eleven sheets of paper for rough work, plus instructions for completing a mark-reading sheet.

Please complete the attendance register on the back page, tear it off and hand it to the invigilator.

Answer *all* questions on the mark-reading sheet supplied. Carefully follow the instructions for completing the mark-reading sheet. Also pay attention to the following:

- Only one option (indicated as [1] [2] [3] [4] [5]) per question is correct. Do not mark more than one option per question on the mark-reading sheet.
- Marks will *not* be deducted for incorrect answers.
- There are 30 questions for a total of 100 marks.

You are strongly advised to write your name on the mark-reading sheet. Then, if you have entered your student number incorrectly, we will still be able to link you to the mark-reading sheet.

Question 1

Elias invested R25 000 on 5 March into an account earning 8,45% simple interest. The amount of interest that has accumulated up to 21 December of the same year equals

[1] R1 684,21.
[2] R1 742,03.
[3] R1 805,87.
[4] R16 842,12.
[5] none of the above.

Question 2

The bank charges a discount rate of 11,9% per year. You will have to pay the bank R48 000 in seven months' time. The amount of money that you will receive *now* equals

[1] R44 668,00.
[2] R44 796,33.
[3] R44 884,28.
[4] R51 332,00.
[5] R51 580,55.

Question 3

If $S = P(1 + rt)$ and $P = S(1 - dt)$, then t equals

[1] $\frac{r-d}{dr}$.
[2] $\frac{r+d}{dr}$.
[3] $\frac{d-r}{dr}$.
[4] $\frac{dr}{r-d}$.
[5] none of the above.

Question 4

Sybil borrowed R17 500 from the Fierce Shark agency at an interest rate of 29,61% per year, compounded weekly. The amount that Sybil will have to pay the agency back after 91 weeks is

[1] R26 568,06.
[2] R29 197,59.
[3] R29 338,66.
[4] R29 381,81.
[5] R36 320,24.

Question 5

A nominal interest rate of 19,4% per year, compounded monthly, is equivalent to a continuous compounding rate of

[1] 19,4%.
[2] 19,558%.
[3] 21,22%.
[4] 21,41%.
[5] none of the above.

Question 6

The nominal interest rate per year, j_m, where m is the number of compounding periods, in terms of the effective rate, j_{eff}, is given by

[1] $j_m = m\left[(j_{eff}-1)^{\frac{1}{m}}-1\right]$.
[2] $j_m = m\left[(j_{eff}+1)^{\frac{1}{m}}-1\right]$.
[3] $j_m = \dfrac{(j_{eff}+1)^m-1}{m}$.
[4] $j_m = \dfrac{(j_{eff}+1)^{\frac{1}{m}}-1}{m}$.
[5] $j_m = m\left[(j_{eff}+1)^m-1\right]$.

Question 7

Every six months an amount of R2 200 is paid into a savings account. The applicable interest rate is 11,32% per year, compounded every four months. After nine years the accumulated amount of these semi-annual payments approximately equals

[1] R66 173.
[2] R66 342.
[3] R80 322.
[4] R100 190.
[5] R107 649.

Questions 8 and 9 relate to the following situation:
Lilian intends to open a beauty parlour and borrows the money from her Aunt Josephine. Lilian feels that she will only be able to start repaying her debt after four years. She will then pay Aunt Josephine R95 000 at the end of every six months for five years. Money is worth 18,6% per year, compounded semi-annually.

Question 8

The present value of Lilian's debt when she will start repaying her Aunt Josephine is equal to

[1] R519 995,65.
[2] R586 176,76.
[3] R601 708,66.
[4] R687 736,46.
[5] R950 000,00.

Question 9

The amount of money, to the nearest rand, that Aunt Josephine lent Lilian equals

[1] R237 500.
[2] R247 278.
[3] R255 294.
[4] R295 410.
[5] R347 603.

Question 10

An amount borrowed at 8,47% interest per year, compounded continuously, has accumulated to R53 580 after eight years. The initial amount borrowed was

[1] R17 274,19.
[2] R27 209,76.
[3] R27 274,60.
[4] R31 938,48.
[5] none of the above.

Question 11

An investment of R250 000 in the Sugar and Spice shop will have the following expected after-tax income per year:

Years	After-tax Income (in rand)
1	60 000
2	65 000
3	75 000
4	70 000
5	60 000

The average rate of return (ARR) on this investment will equal

[1] 7,58%.
[2] 9,95%.
[3] 15,15%.
[4] 20,00%.
[5] 26,40%.

Question 12

The next coupon date that follows the settlement date of Stock 538 is 28/09/2010. The half-yearly coupon rate is 7,375%. The accrued interest equals R5,49589%. The settlement date for this stock is

[1] 16 May 2010.
[2] 16 June 2010.
[3] 11 August 2010.
[4] 28 September 2010.
[5] none of the above.

Question 13

The One-arm-bandit fund must pay Peter Pan R3 500 per month indefinitely. The approximate amount of money in the fund, with an applicable interest rate of 11,2% per year, compounded monthly, equals

[1] R229 934.
[2] R330 132.
[3] R334 661.
[4] R375 000.
[5] R390 443.

Questions 14 and 15 relate to the following situation:
The values in the following table represent the cash outflows of the Cut and Colour hair salon:

Year	*Cash outflows* R
3	*25 000*
5	*50 000*
7	*75 000*
9	*30 000*

The applicable interest rate is 8,64% per year.

Question 14

The present value of the cash outflows approximately equals

[1] R108 755.
[2] R157 965.
[3] R180 000.
[4] R202 549.
[5] none of the above.

Question 15

If the MIRR of the Cut and Colour hair salon equals 18,472%, then the future value of the cash inflows approximately equals

[1] R399 000.
[2] R500 000.
[3] R726 300.
[4] R827 600.
[5] R931 300.

Questions 16 and 17 relate to the following situation:
Debbie bought a town house. She made a down payment of R350 000 and managed to secure a loan for the remainder for 20 years. The applicable interest rate is 10,5% per year, compounded monthly. Her monthly payments are R8 486,23.

Question 16

The price of the house equals

[1] R838 193.
[2] R850 000.
[3] R864 527.
[4] R1 200 000.
[5] R1 288 193.

Question 17

Assume that the interest rate stays the same for the whole period. Then the amount of interest that will be paid by Debbie (to the nearest rand) equals

[1] R836 345.
[2] R938 193.
[3] R1 186 695.
[4] R1 686 695.
[5] R2 036 695.

Question 18

The equation for the present value of Stock 123 on 01/11/2010 is given by

$$P(01/11/2010) = 6{,}6a_{\overline{34}|0{,}0785} + 100\,(1+0{,}0785)^{-34}$$

The fraction of the half year to be discounted back is

$$f = \frac{37}{184}.$$

The accrued interest is R5,31616%. The clean price of Stock 123 equals

[1] R78,69331%.
[2] R84,00947%.
[3] R85,19377%.
[4] R85,29586%.
[5] R90,50993%.

Questions 19, 20 and 21 relate to the following situation:
The following table is an extract from the sinking fund schedule of The Busy Feet club. The money that they will have accumulated at the end of the period will be used to redecorate the club.

Period	Interest earned	Deposit	Addition to fund	Accumulated amount in the fund
1	a	7 444,64	b	c
2	707,24	d	8 151,38	e
3	A	f	8 926,30	24 522,83
4	g	h	i	34 297,14
5	j	7 444,64	B	45 000,00

(All the amounts are in rand.)

Question 19

The applicable interest rate equals

[1] 4,5%.
[2] 8,7%.
[3] 9,0%.
[4] 9,5%.
[5] none of the above.

Question 20

The value of A equals

[1] R1 481,67.
[2] R2 329,67.
[3] R3 258,22.
[4] R4 275,00.
[5] R8 151,89.

Question 21

The value of B equals

[1] R3 258,22.
[2] R7 444,64.
[3] R7 776,80.
[4] R10 702,86.
[5] none of the above.

Question 22

Consider Stock 525.

Coupon rate:	9,6% per year
Yield to maturity:	10,4% per year
Settlement date:	17 May 2010
Maturity date:	14 December 2033

The all-in-price equals

[1] R92,29517%.
[2] R92,33574%.
[3] R97,05788%.
[4] R97,06202%.
[5] R97,09865%.

Question 23

Julius inherits R2 500 000. He decides to have it paid to him in two payments: one payment four years from *now* and the other payment, three times the size of the first payment, ten years from *now*. The amount that he can expect to receive ten years from *now*, if an interest rate of 12,25% per year, compounded quarterly, is applicable, approximately equals

[1] R1 650 400.
[2] R1 875 000.
[3] R2 088 850.
[4] R4 951 240.
[5] R6 266 545.

Question 24

Anton wants to open the Feel Safe shop at the Village Mall. He estimates that he will have R375 000 available on 24 October 2010 from the investment he made on 5 May 2009, earning 7,91% interest per year, compounded on the 1st day of each month. If simple interest is used for the odd periods and compound interest for the full terms, then the amount that Anton deposited on 5 May 2009 equals

[1] R333 952,66.
[2] R334 024,63.
[3] R335 908,77.
[4] R418 640,45.
[5] R421 092,61.

Questions 25 and 26 relate to the following situation:
The following table represents the selling price of a house sold by the Stiff Upper Lip agency, in thousand of rands, and the number of houses sold at that price.

Number of houses sold (y)	*25*	*17*	*12*	*8*	*3*
Price per house (x)	*400*	*750*	*1 200*	*1 800*	*2 400*

The agency suspects that there is a linear relationship between the number of houses sold and the price of a house.

Question 25

The slope of the linear regression line equals

[1] $-0{,}9715$.
[2] $-0{,}0102$.
[3] 2,6394.
[4] 5.
[5] none of the above.

Question 26

The correlation coefficient of a linear regression between the number of houses sold and the price of a house is

[1] $-1{,}8473$.
[2] $-0{,}9715$.
[3] $-0{,}0102$.
[4] 2,6394.
[5] none of the above.

Question 27

Hilary would like to go on a world tour in four years' time. She estimates that it will cost her R209 000. She *immediately* starts to make weekly deposits into an account earning 13,4% interest per year, compounded weekly. Hilary's weekly deposits equal

[1] R758,77.
[2] R760,72.
[3] R1 004,81.
[4] R1 295,96.
[5] R1 299,30.

Questions 28 and 29 relate to the following situation:
Four years ago Frank borrowed R15 500 from Deon. The condition then was that he would pay him back in seven years' time (three years from now) at an interest rate of 12,65% per year, compounded semi-annually. Frank must also pay Deon R35 000 six years from now. *The applicable interest rate on this amount is 9,5% per year, compounded monthly.*

Question 28

The amount of money that Frank will have to pay Deon three years from *now* if both debts are paid then, equals

[1] R36 578,61.
[2] R50 500,00.
[3] R54 285,34.
[4] R71 578,61.
[5] none of the above.

Question 29

Frank decides to reschedule his debt: one payment of R15 000 *now*, and one payment five years from *now*. Deon agrees on condition that the new agreement, that will run from *now*, will be subject to 10,9% interest per year, compounded quarterly. The amount that Frank must pay Deon five years from *now* equals

[1] R30 155,01.
[2] R35 500,00.
[3] R45 155,01.
[4] R51 627,67.
[5] R52 907,43.

Question 30

Vicky owes Cindy an amount of money that must be paid back over a period of 24 months. She will repay it as follows: the first 15 payments of R4 000 each will be paid at the beginning of each month; thereafter the payments will be R7 000 each per month, paid at the end of each month. An interest rate of 16,4% per year, compounded monthly, is applicable. The amount of money that Vicky owes Cindy approximately equals

[1] R101 970.

[2] R102 706.

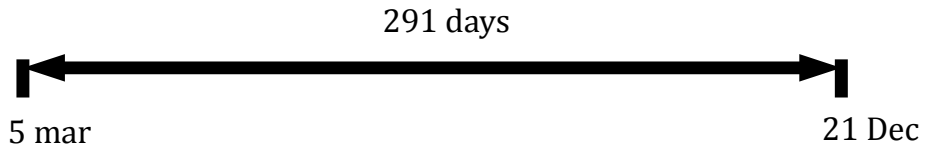
[3] R112 821.

[4] R113 557.

[5] R123 000.

MAY/JUNE 2010

1 Identification: Simple interest



$$SI = \Pr T$$
$$= 25\,000 \times 0.0845 \times \frac{291}{365}$$
$$= R1\,684.21 \qquad option(1)$$

2 Identification: Discount

$$P = 5(1 - dt)$$
$$= 48\,000(1 - 0.119 \times {}^{7}\!/_{12})$$
$$= R44\,668 \qquad option(1)$$

3 Identificatio: Discount

$$If\ S = P(1 + rt)\ and\ P] = s(1 - dt)$$
$$t = \left(1 - \frac{d}{r}\right) \div d$$
$$t = \frac{\left(1 - \frac{d}{r}\right)}{d} \qquad option(5)$$

4 Identification:Compounding interest

$$S = P(1+i)^n$$
$$= 17\,500\left(1+\frac{0.2961}{52}\right)^{52\times\frac{91}{52}}$$
$$= R29\,338.66 \qquad option(3)$$

5. Identification: Continuous compounding

$$C = m\ln\left(1+\frac{jm}{m}\right)$$
$$= 2\ln\left(1+\frac{0.194}{12}\right)$$
$$= 19.24\% \qquad option(5)$$

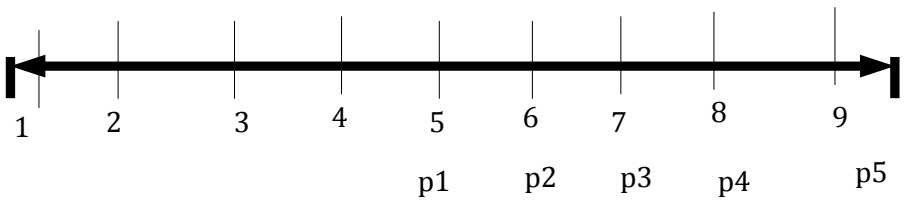
6. Identification: Normal and effective interest rates

$$jm = m\left[\left(jeff+1\right)^m - 1\right] \qquad option(5)$$

7. Identication: Annuities

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$
$$= 2\,200\left[\frac{\left(1+\frac{0.1132}{3}\right)^{9\times3} - 1}{0.1132}\right]$$
$$= R66173 \qquad option(1)$$

8. Identification:Deferred annuity



$$PV = Ran:\left(1+\frac{vm}{m}\right)^{-tm}$$

$$= 95\,000\,a\overline{5\times 2}\,0.186 \div 2\left(1+\frac{0.186}{2}\right)^{-5\times 2}$$

$$= R601\,708.66 \qquad option(3)$$

9. Identification: Differed annuity

$$PV = S(1+i)^{-n}$$

$$= 601\,708.66\left(1+\frac{0.186}{2}\right)^{-4\times 2}$$

$$= R601\,708.66 \qquad option(3)$$

10. Identification: Continuous compounding

$$S = Pe^{ct}$$

$$P = Se^{-ct}$$

$$= 53\,580e^{-(0.0847\times 8)}$$

$$= R27\,209.76 \qquad option(2)$$

11. Identification: Evaluation of cash flows

$$APR = \frac{Average\,after\,tax - income}{Investment\,level}$$
$$= \frac{330\,000 \div 5}{250\,000}$$
$$= 26,4\% \qquad option\,(5)$$

12. Identification: band

Settlement date of the stock is <u>11 August 2010</u> as the next coupon date of stock 538 is 28/09/2010.

Option (3)

13. Identification: Perpetuity

$$P = \frac{R}{L}$$
$$= \frac{3\,500}{\left(\frac{1,112}{12}\right)}$$
$$= R\,375\,000 \qquad option\,(4)$$

14. Identification: Evaluation of cash flows

$$PVout = 25\,000 \times (1 + 0,0864)^{-3} + 50\,000 \times (1 + 0,0864)^{-5} +$$
$$75\,000 \times (1 + 0,0864)^{-7} + 30\,000 \times (1 + 0,0864)^{-9}$$
$$= 19\,497,13 + 33\,038,57 + 41\,988,75 + 14\,230,28$$
$$= R\,108\,755 \qquad option\,(1)$$

15. Identification: Evaluation of cash flows

$$MIRR = \left(\frac{C}{PVout}\right)^{\frac{i}{n}} - 1$$

$$C = PVout(1+i)^n$$
$$= 108\,755(1+0,18472)$$
$$= R500\,024$$
$$= R500\,000 \qquad option(2)$$

16. Identification: Sinking funds

$$\text{Price of the house} = R350\,000 + PV \text{ of the loan}$$
$$PV = 8486,23a(20\times12)0,105\div12$$
$$= R850\,000$$
$$\text{Total price} = R850\,000 + 350\,000$$
$$= R120\,000 \qquad option(4)$$

17. Identification: Sinking funds

$$I = \text{no. of payments} \times \text{payments} - \text{the loan}$$
$$= 20\times12\times8486,23 - 850\,000$$
$$= R2036\,695 - 850\,000$$
$$= R1186\,695,20$$
$$= R1186\,695 \qquad option(3)$$

18. Identification: Bond

Financial calculator

BOND

$$\text{Clean Price} = \text{All in price} - \text{Accrued Interest}$$
$$= 90,61202 - 5,31616\%$$
$$= R85229586\%$$

19. Identification: Amortisation

$$\begin{aligned} Applicable\ \text{int}erest\ rate &= \frac{\text{int}erest\ due}{accumulated\ amount\ in\ the\ fund} \\ &= \frac{707,25}{24\,522,83-8926,30} \\ &= \frac{707,25}{15\,596,53} \\ &= 4,5346\% \\ &= 4,5\% \qquad\qquad option(1) \end{aligned}$$

20. Identification: Amortisation

$$\begin{aligned} Interest\ rate &= \text{Pr}incipal\ paid - payment \\ &= R8151,38-7444,64 \\ &= R1481,67 \qquad\qquad option(1) \end{aligned}$$

21. Identification: Amortisation

$$\begin{aligned} &Value\ of\ B \rightarrow addition\ to\ fund \\ &Addition\ to\ fund = 7444,64-(45\,000\times 4,5\%) \\ &\qquad\qquad = 7\,444,64-2025 \\ &\qquad\qquad = R5\,419,64 \qquad\qquad option(5) \end{aligned}$$

22. Identification: Bond

Financial calculator : Clear memory and press BOND button

$COUPON\left(PMT\right) \rightarrow 9,6 \quad ENT \ \nabla$

$REDEMPT\left(FV\right) \rightarrow 100 \quad ENT \ \nabla$

$17-05-2010\left(Settlement\ date\right) ENT \ \nabla$

$14-12-2033\left(Maturity\ date\right) \ ENT \ \nabla$

$CPN/Y\left(N\right) \rightarrow 2\left(always\ 2\right) \ ENT \ \nabla$

$YIELD\left(1/Y\right) \rightarrow 10,4 \ ENT \ \nabla$

$PRICE\left(PV\right) \rightarrow PRESS\ COMP\ BUTTON \rightarrow 92,99634150$

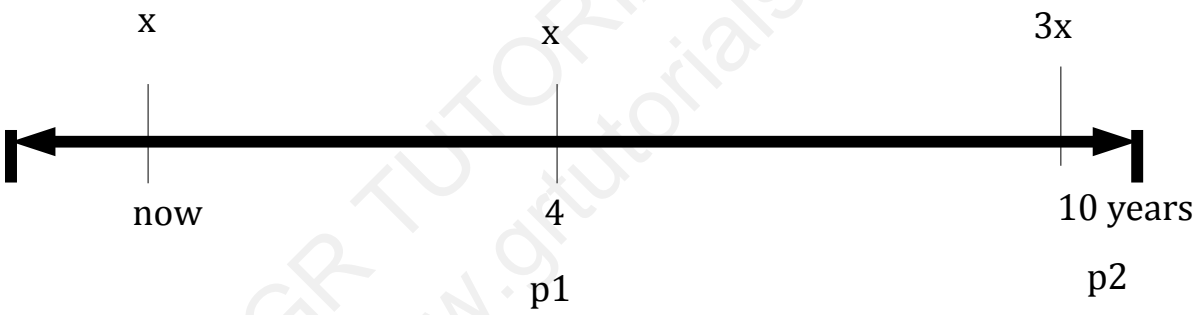
$ACCU\ INT \rightarrow PRESS\ COMP\ BUTTON \rightarrow 4,061538462$

$\therefore All\ in\ price = \text{Pr}ice\left(PV\right) + ACCU\ INT$

$= 92,99634150 + 4,061538462$

$= R97,05788\% \qquad option\left(3\right)$

23. Identification: Annuity



Obligations

$2\,500\,000\left(1+\frac{0,1225}{4}\right)^{10\times4} = Payments$

$2\,500\,000\left(1+\frac{0,1225}{4}\right)^{40} = \times\left(1+0,1225\div4\right)^{6\times4}\times3\times$

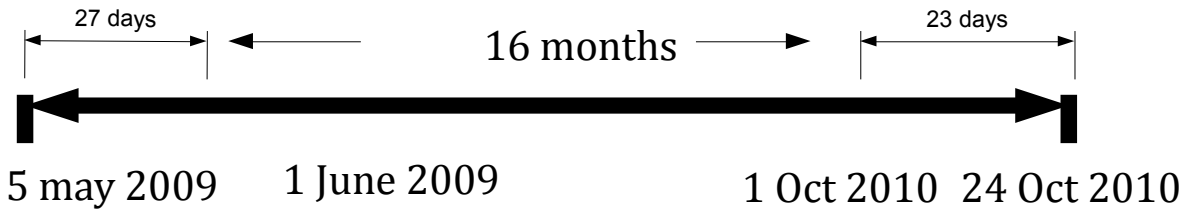
$2\,500\,000\left(1+\frac{0,1225}{4}\right)^{40} = 5,06261\times$

$\frac{8\,355\,393,89}{5,06261} = \times$

$\times = R1\,650\,412,32$

$\times\times3 = R4\,951\,236,95 \qquad option\left(4\right)$

24. Identification: Simple interest Compound interest



$$Simple\ \text{int}erest\ for\ odd\ periods$$

$$P = \frac{S}{1+rt}$$

$$= \frac{R375\,000}{1+0,0791\times\frac{27}{365}}$$

$$= R372\,818,55$$

$$Coumpound\ \text{int}erest\ for\ full\ terms$$

$$P = S\left(1+\frac{jm}{m}\right)^{-tm}$$

$$= 372\,818,55\left(1+\frac{0,0791}{12}\right)^{-12\times\frac{16}{12}}$$

$$= R335\,617,209$$

$$Simple\ \text{int}erest\ for\ odd\ periods$$

$$P = \frac{S}{1+rt}$$

$$= \frac{355\,617,21}{1+0,0791\times 23\div 365}$$

$$= R333\,952,66 \qquad option(1)$$

25. Identification: Regression line

Financial calculator

Slope for the angle $y = a + bx$

rcl $r = 92,308$ $\qquad option(5)$

26. Identification: Regression line

Financial calculator

$rcl\ \ r = -0,97,15 \qquad option(2)$

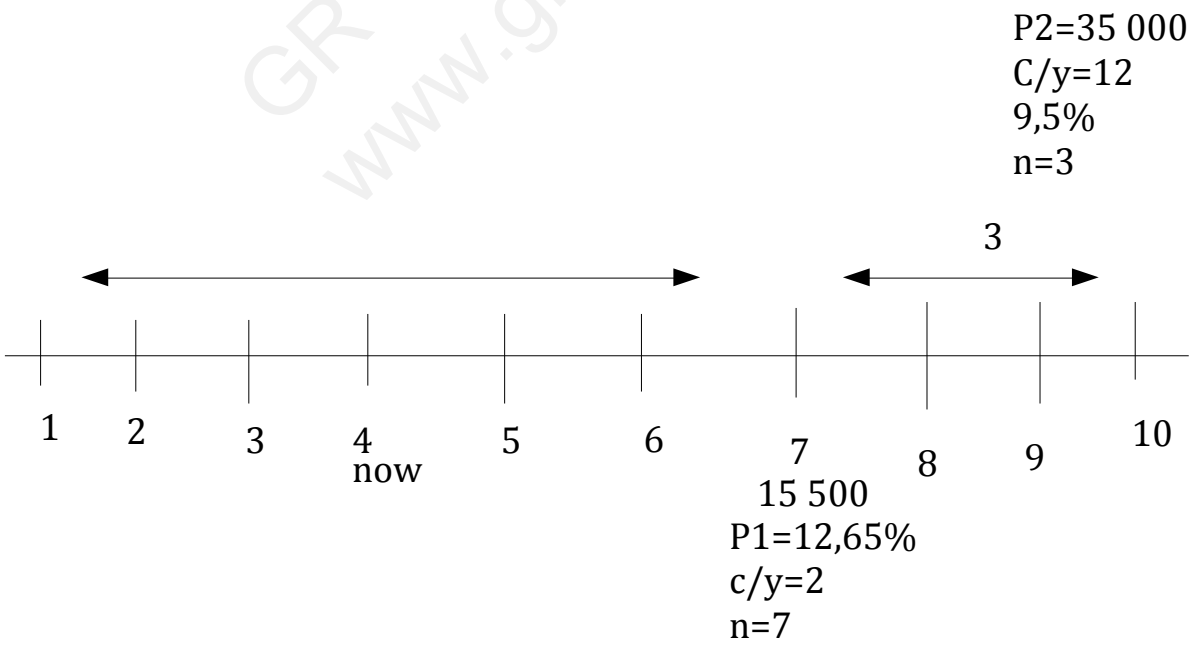
27. Identification: Annuity due

$$PV = FV(1+i)^{-n}$$
$$= 209\,000\left(1+\frac{0,134}{52}\right)^{-52\times 4}$$
$$= R122\,366,87$$

$$122\,366,87 = R(54\times 2)0,134 \div 52$$
$$R = R758,77$$

$weekly\ deposits = R758,77 \qquad option(1)$

28. Identification: Annuity



Payment 1

$$S = 15\,500\left(1+\frac{0,1265}{2}\right)^{2\times 7}$$

$$= R36\,578,61$$

$$P2\ S = 35\,000\left(1+\frac{0,095}{12}\right)^{-12\times 3}$$

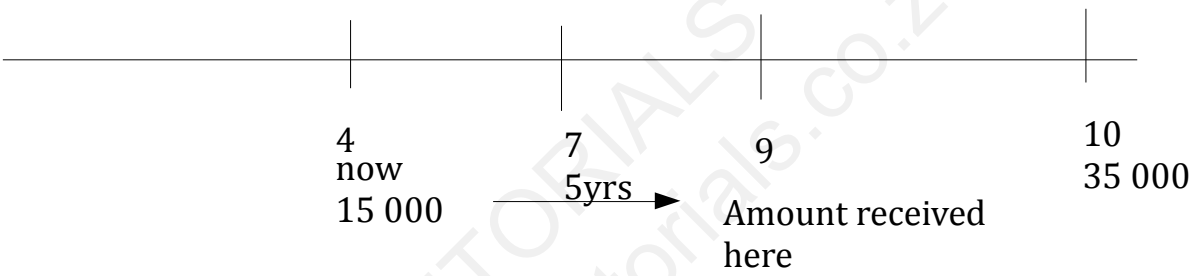
$$= R26\,350,053$$

Total amount Frank has to pay back

$$= P1 + P2$$

$$= R62\,928,66 \qquad option(5)$$

29. Identification: Annuity



Payments = Obligations

$$15\,000\left(1+\frac{0,109}{4}\right)^{4\times 5} + \times = 62\,928,66\left(1+\frac{0,109}{4}\right)^{2\times 4}$$

$$x = 62\,928,66\left(1+\frac{0,109}{4}\right)^{8} - 15\,000\left(1+\frac{0,109}{4}\right)^{20}$$

$$= R52\,907,43 \qquad option(5)$$

30. Identification: Annuity due and ordinary annuity

1*st set of payments* : *annuity due*

$$P=(1+i)\,R\,a(n)i$$

$$=(1+0{,}164\div 12)\,4000a\left(\frac{15}{12}\times 12\right)\frac{0{,}164}{12}$$

$$PV=R54\,655{,}23$$

2*nd set of payments* : *ordinary annuity*

$$P=R\left(\frac{(1+i)^n-1}{i(1+i)^n}\right)$$

$$=7000\left(\frac{\left(1+\frac{0{,}614}{12}\right)^{\frac{9}{12}}-1}{\frac{0{,}614}{12}\left(1+\frac{0{,}614}{12}\right)^{\frac{9}{12}\times 12}}\right)$$

$$=R58\,902{,}19$$

The amount that Vicky owes Cindy

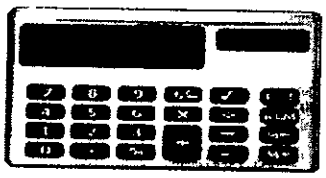
$$P1+P2$$

$$=R54\,655{,}23+58\,902{,}19$$

$$=113\,557{,}42$$

$$=R113\,557 \qquad option(4)$$

UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (469072)
RDS1630 (475608)

May/June 2011

INTRODUCTORY FINANCIAL MATHEMATICS

Duration 2 Hours

100 Marks

EXAMINERS
FIRST MRS E MUDIMU
SECOND MRS S ROTHMANN

Programmable pocket calculator is permissible

This paper consists of 23 pages including a list of formulæ, a table with the number of each day of the year and 10 sheets of paper for rough work, plus instructions for completing a mark-reading sheet.

Please complete the attendance register on the back page, tear it off and hand it to the invigilator.

Answer *all* questions on the mark-reading sheet supplied. Follow the instructions for completing the mark-reading sheet carefully. Also pay attention to the following:

- Only one option (indicated as [1] [2] [3] [4] [5]) per question is correct. Do not mark more than one option per question on the mark-reading sheet.
- Marks will *not* be deducted for incorrect answers.
- There are 30 questions for a total of 100 marks.

You are strongly advised to write your name on the mark-reading sheet. Then, if you have entered your student number incorrectly, we will still be able to link you to the mark-reading sheet.

[TURN OVER]

Question 1

Fatima has deposited R25 000 in an account earning 7,5% simple interest per year The accumulated amount after 545 days will equal

[1] R27 799,66
[2] R27 965,11
[3] R28 152,72
[4] R57 654,40
[5] R52 996,58

Question 2

If $S = P(1 + rt)$ and $P = S(1 - dt)$, then t can be denoted by

[1] $\left(1 - \frac{d}{r}\right)/d$
[2] $\left(\frac{d}{r} - 1\right)/d$
[3] $r - \frac{1}{d}$
[4] $\left(\frac{S}{P} - 1\right)r$
[5] $\left(1 - \frac{S}{P}\right)d$

Question 3

Juan needs R55 000 on 19 November In order to provide this amount, he invested a sum of money 21 months earlier in an account earning 8,15% interest per year, compounded monthly This sum of money amounted to

[1] R47 155,63
[2] R47 712,35
[3] R47 953,05
[4] R48 134,78
[5] none of the above

Question 4

An interest rate of 19,9% per year, compounded quarterly, is equivalent to a weekly compounded rate of

[1] 19,42%
[2] 19,46%
[3] 19,86%
[4] 20,36%
[5] 21,43%

ROUGH WORK

Question 5

An effective rate for a continuous compounding rate of 17,5% is equivalent to

[1] 16,13%
[2] 17,37%
[3] 17,63%
[4] 18,97%
[5] 19,12%

Question 6

Four years ago Pitso borrowed R10 000 from Clive at 10,65% per year, compounded quarterly Sixteen months ago he borrowed another R25 000 from Clive at 8,7% per year compounded monthly The amount that Pitso will owe Clive three years from *now* equals

[1] R35 000,00
[2] R50 105,06
[3] R57 268,50
[4] R57 768,16
[5] R60 293,02

Question 7

On her 40th birthday Susan decides that she will go for a facelift when she turns 50 She estimates that it will cost her R48 000 She starts *saving immediately* each month by paying an amount into an account earning 8,58% interest per year, compounded monthly The monthly payment equals

[1] R252,18
[2] R253,99
[3] R255,80
[4] R592,95
[5] R597,19

Questions 8 and 9 relate to the following situation.
Pretty wants to open the Elegant Face Shop on 15 July 2011. On 4 March 2010 she deposited R450 000 in an account earning 7,65% interest per year, compounded monthly. Interest is credited on the 1st day of the month.

Question 8

If simple interest is used for odd periods and compound interest for the rest of the term, then the amount that she will have available on 15 July 2011 equals

[1] R493 007,67
[2] R499 309,76
[3] R499 363,00
[4] R499 371,53
[5] none of the above

Question 9

If fractional compounding is used for the full term, then the amount that Pretty will have available on 15 July 2011 equals

[1] R494 979,74
[2] R495 124,96
[3] R499 307,43
[4] R499 368,28
[5] none of the above

Question 10

Muzi invested R25 500. After 54 months the accumulated amount was R36 550. Therefore the applicable continuous compounding rate equals

[1] 6,7%
[2] 8,0%
[3] 8,3%
[4] 9,6%
[5] none of the above

Questions 11, 12 and 13 relate to the following situation

Consider Bond (Stock) 567

Coupon rate	*9,75% per year*
Yield to maturity	*7,95% per year*
Maturity date	*17 April 2036*
Settlement date	*2 September 2011*

Question 11

The all-in-price equals

[1] R104,48134%
[2] R118,15090%
[3] R119,28886%
[4] R122,97940%
[5] R124,16386%

Question 12

The accrued interest equals

[1] R1,84315%
[2] R2,44418%
[3] R3,68630%
[4] R4,88836%
[5] none of the above

Question 13

The clean price equals

[1] R102,63819%
[2] R115,60256%
[3] R115,90672%
[4] R119,27550%
[5] R119,29310%

Questions 14 and 15 relate to the following situation:
Florence took out an endowment policy 30 years ago Her original payment was R6 000 per year This amount was increased yearly by R1 200 The applicable interest rate was 9,5% per year

Question 14

The amount that Florence can expect to receive now approximately equals

[1] R1 077 750
[2] R1 456 697
[3] R2 273 684
[4] R2 409 967
[5] R2 788 915

Question 15

The accumulated interest up till now approximately equals

[1] R702 000
[2] R754 697
[3] R1 707 967
[4] R2 086 914
[5] none of the above

Question 16

If the future value of an increasing annuity is denoted by S, and the amount with which the original payment is increased yearly by Q, and the applicable interest rate by i and the time under consideration by n, then the initial payment R can be expressed as

[1] $\dfrac{S - \frac{Q}{i}s_{\overline{n}|i} + \frac{nQ}{i}}{s_{\overline{n}|i}}$

[2] $\dfrac{S + \frac{Q}{i}s_{\overline{n}|i} - \frac{nQ}{i}}{s_{\overline{n}|i}}$

[3] $S - \dfrac{Q}{i}s_{\overline{n}|i} + \dfrac{nQ}{i}$

[4] $S + \dfrac{Q}{i}s_{\overline{n}|i} + \dfrac{nQ}{i}$

[5] $S - \dfrac{Q}{i} - \dfrac{nQ}{i}$

Questions 17, 18 and 19 relate to the following situation
The following is an extract from an amortisation schedule for the Busy Fingers Knit Shop The loan will be paid off in 15 years

Month	*Outstanding principal at beginning of month*	*Interest due at end of month*	*Payment*	*Principal repaid*	*Outstanding principal at month end*
15	*R385 232,41*	*R3 081 86*	*A*	*R1 119,21*	*a*
120	*R202 152,34*	*R1 617 22*	*A*	*B*	*R199 568,48*
149	*R118 191,36*	*R945 53*	*A*	*R3 255 54*	*b*
150	*C*	*c*	*A*	*d*	*e*

Question 17

The value of A equals

[1] R125,00
[2] R344,20
[3] R1 962 65
[4] R2 140,18
[5] R4 201,07

Question 18

The value of B equals

[1] R124,99
[2] R1 684,60
[3] R2 583,85
[4] R3 369,21
[5] R5 818,29

Question 19

The value of C equals

[1] R113 990,29
[2] R114 935,82
[3] R120 501,37
[4] R121 446,90
[5] R122 392,43

Question 20

A is a representative group or subset of the population, that is, it is the portion of the population that is selected for analysis The missing word here is

[1] deviation
[2] mean
[3] regression
[4] variance
[5] none of the above

Question 21

The following table shows the number of loans approved for different amounts during the second half of 2010 A linear relationship is expected

Amount of loan in R100 000 (x)	Number of loans approved (y)
2	15
3	20
4	18
5	13
6	9

The linear regression line equation is denoted by

[1] $y = -1{,}9x + 22{,}6$
[2] $y = -0{,}256x + 7\,85$
[3] $y = 22{,}6x - 1{,}9$
[4] $y = 7{,}85x - 0{,}256$
[5] $y = -0{,}6985 + 15$

Questions 22 and 23 relate to the following situation:
Bi Cycle agreed to establish the Spike Fund from which they will pay Handle R2 500 per month indefinitely as compensation for injuries he sustained while working on the Riley project Money is worth 12,5% per year, compounded monthly

Question 22

The opening balance of this fund equals

[1] R170 792,83
[2] R200 000,00
[3] R240 000,00
[4] R281 869,63
[5] R492 680,86

Question 23

Handle asks that the compensation be rescheduled into two payments one payment five years from *now* and the other one four times the size of the first payment, ten years from *now* This is agreed to on the condition that the interest rate changes to 11,8% per year, compounded every four months The amount of money that Handle can expect to receive ten years from *now* approximately equals

[1] R132 023
[2] R132 644
[3] R192 000
[4] R528 094
[5] R530 576

Question 24

Stanley bought a house and managed to secure a home loan for R1 500 000 with monthly payments of R13 981,97 at a fixed interest rate of 9,5% per year, compounded monthly The term of the loan is 20 years If an average yearly inflation rate of 6,4% is expected, then the real cost of the loan equals

[1] R50 117,36
[2] R92 785,21
[3] R390 227,98
[4] R1 855 672,80
[5] R1 890 227,99

Questions 25 and 26 relate to the following situation.
The following table represents the cash flows of the Green Fingers Nursery

Period	*Cash flows (in rand)*
3	*150 000*
5	*− 70 000*
7	*− 90 000*
8	*120 000*
10	*−75 000*

Money can be borrowed at 11,5% per period and invested at 8,70% per period

Question 25

The present value of the cash outflows equals

[1] R107 878,15
[2] R128 884,72
[3] R183 697,22
[4] R194 288,21
[5] R235 000,00

Question 26

The future value of the cash inflows equals

[1] R270 000,00
[2] R339 855,80
[3] R365 641,26
[4] R470 564,40
[5] none of the above

Question 27

If the MIRR for a project lasting eight years is 10,81% and the present value of the cash outflows equals R291 930 then the future value of the cash inflows will approximately equal

[1] R128 400
[2] R263 450
[3] R323 500
[4] R663 600
[5] none of the above

Question 28

Nadine invested R840 000 in her Fine Hair Salon Her cash flows over the next five years are expected to be as follows
R200 000, R350 000, R275 000, R400 000 and R300 000
The IRR (internal rate of return) equals

[1] 18,48%
[2] 20,35%
[3] 21,56%
[4] 22,90%
[5] none of the above

Questions 29 and 30 relate to the following situation:
Frans invested R350 000 in an account earning 8,5% interest per year, compounded quarterly After five years the interest rate changed to 7,9% per year, compounded monthly He then decided to deposit R60 000 at the beginning of each month into this account

Question 29

The balance in the account when the interest rate changed equals

[1] R442 580,84
[2] R443 259,97
[3] R498 750,00
[4] R532 978,19
[5] R534 555,21

Question 30

The total balance in the account after eight years will equal

[1] R2 428 469,37
[2] R2 444 456,79
[3] R3 103 463,36
[4] R3 119 450,78
[5] R5 537 771,27

The number of each day of the year

FOR LEAP YEARS ADD ONE TO THE NUMBER OF EVERY DAY AFTER FEBRUARY 28

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	**1**
2	2	33	61	92	122	153	183	214	245	275	306	336	**2**
3	3	34	62	93	123	154	184	215	246	276	307	337	**3**
4	4	35	63	94	124	155	185	216	247	277	308	338	**4**
5	5	36	64	95	125	156	186	217	248	278	309	339	**5**
6	6	37	65	96	126	157	187	218	249	279	310	340	**6**
7	7	38	66	97	127	158	188	219	250	280	311	341	**7**
8	8	39	67	98	128	159	189	220	251	281	312	342	**8**
9	9	40	68	99	129	160	190	221	252	282	313	343	**9**
10	10	41	69	100	130	161	191	222	253	283	314	344	**10**
11	11	42	70	101	131	162	192	223	254	284	315	345	**11**
12	12	43	71	102	132	163	193	224	255	285	316	346	**12**
13	13	44	72	103	133	164	194	225	256	286	317	347	**13**
14	14	45	73	104	134	165	195	226	257	287	318	348	**14**
15	15	46	74	105	135	166	196	227	258	288	319	349	**15**
16	16	47	75	106	136	167	197	228	259	289	320	350	**16**
17	17	48	76	107	137	168	198	229	260	290	321	351	**17**
18	18	49	77	108	138	169	199	230	261	291	322	352	**18**
19	19	50	78	109	139	170	200	231	262	292	323	353	**19**
20	20	51	79	110	140	171	201	232	263	293	324	354	**20**
21	21	52	80	111	141	172	202	233	264	294	325	355	**21**
22	22	53	81	112	142	173	203	234	265	295	326	356	**22**
23	23	54	82	113	143	174	204	235	266	296	327	357	**23**
24	24	55	83	114	144	175	205	236	267	297	328	358	**24**
25	25	56	84	115	145	176	206	237	268	298	329	359	**25**
26	26	57	85	116	146	177	207	238	269	299	330	360	**26**
27	27	58	86	117	147	178	208	239	270	300	331	361	**27**
28	28	59	87	118	148	179	209	240	271	301	332	362	**28**
29	29		88	119	149	180	210	241	272	302	333	363	**29**
30	30		89	120	150	181	211	242	273	303	334	364	**30**
31	31		90		151		212	243		304		365	**31**

FORMULÆ

$$I = Prt$$

$$S = P(1 + rt)$$

$$P = S(1 - dt)$$

$$S = P\left(1 + \frac{\jmath_m}{m}\right)^{tm}$$

$$\jmath_{eff} = 100\left(\left(1 + \frac{\jmath_m}{m}\right)^{m} - 1\right)$$

$$S = Pe^{ct}$$

$$\jmath_\infty = 100(e^c - 1)$$

$$c = m\ln\left(1 + \frac{\jmath_m}{m}\right)$$

$$\jmath_m = m\left(e^{\frac{c}{m}} - 1\right)$$

$$\imath = n\left(\left(1 + \frac{\jmath_m}{m}\right)^{\frac{m}{n}} - 1\right)$$

$$S = R\left(\frac{(1+\imath)^n - 1}{\imath}\right)$$

$$S = Rs_{\overline{n}|\imath}$$

$$P = Ra_{\overline{n}|\imath}$$

$$P = R\left(\frac{(1+\imath)^n - 1}{\imath(1+\imath)^n}\right)$$

$$A = nR + Q\left[\frac{n(n-1)}{2}\right]$$

$$r = \frac{d}{1 - dt}$$

$$S = (1+\imath)Rs_{\overline{n}|\imath}$$

$$P = (1+\imath)Ra_{\overline{n}|\imath}$$

$$P = da_{\overline{n}|z} + 100(1+z)^{-n}$$

$$\frac{H - R}{365} \times c$$

$$\frac{-R}{365} \times c$$

$$MIRR = \left(\frac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$$

$$P = \frac{R}{\imath}$$

$$S = \left[R + \frac{Q}{\imath}\right]s_{\overline{n}|\imath} - \frac{nQ}{\imath}$$

$$T_r = Ra_{\overline{n}|r} - P$$

$$\bar{x} = \frac{\sum_{\imath=1}^{n} x_\imath}{n}$$

$$\bar{x}_w = \frac{\sum_{\imath=1}^{n} x_\imath w_\imath}{\sum_{\imath=1}^{n} w_\imath}$$

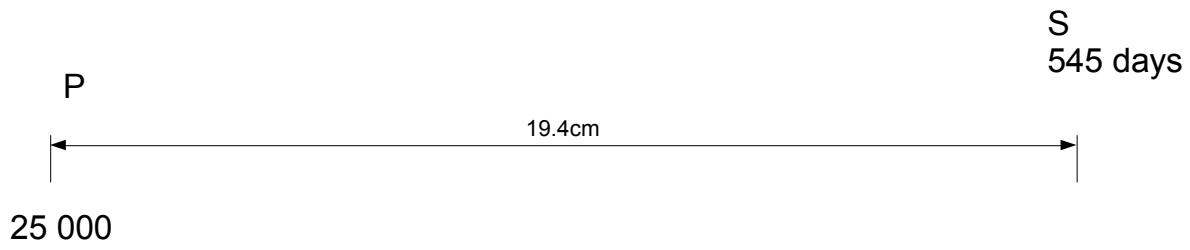
$$\sum_{\imath=1}^{n} \imath = \frac{n(n+1)}{2}$$

$$S = \sqrt{\frac{\sum_{\imath=1}^{n}(x_\imath - \bar{x})^2}{n-1}}$$

MAY/JUNE 2011 SOLUTION

Question 1

Identification: Simple interest



$$Interest\ rate = 7,5\%\ per\ year$$

$$time = \frac{545}{365}$$

$$\therefore S = P(1+rt)$$

$$= 25\,000\left(1+0,075\times\frac{545}{365}\right)$$

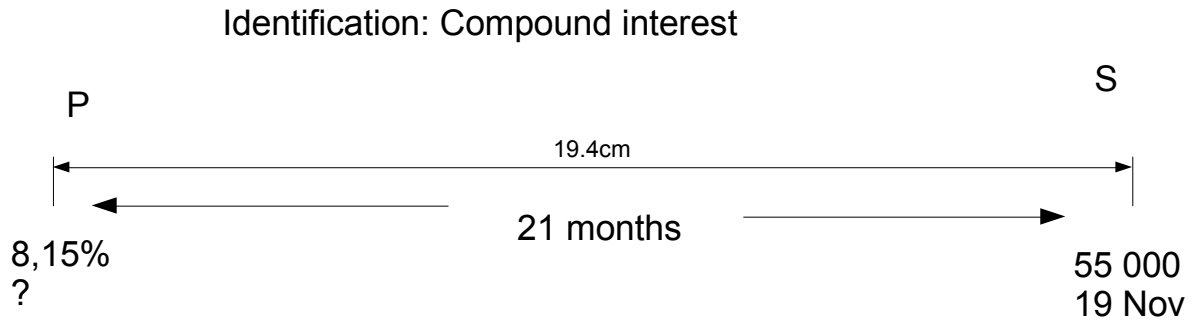
$$= 25\,000\left(+0,075\times 1,4935\right)$$

$$= 27\,799,66 \qquad Option\,(1)$$

Question 2

$$S = P(1+rt)$$
$$P = S(1-dt)$$
$$S = S(1-dt)(1+rt)$$
$$\frac{S}{S} = (1-dt)(1+rt)$$
$$1+rt = \frac{1}{(1-dt)}$$
$$rt = \frac{1}{1-dt} - 1$$
$$= \frac{1-1(-dt)}{(1-dt)}$$
$$= \frac{1-1+dt}{1-dt}$$
$$rt = \frac{dt}{1-dt}$$
$$r = \frac{dt}{1-dt} \times \frac{1}{t}$$
$$r = \frac{d}{1-dt}$$
$$1-dt = \frac{d}{r}$$
$$dt = 1 - \frac{d}{r}$$
$$t = \left(1 - \frac{d}{r}\right)/d \qquad Option(1)$$

Question 3



$$P = S\left(1+\frac{Vm}{m}\right)^{-tm}$$
$$= 55\,000\left(1+\frac{0,0815}{12}\right)^{-\frac{21}{12}\times 12}$$
$$= 55\,000\left(1+\frac{0,0815}{12}\right)^{-21}$$
$$= 47\,712,35 \qquad Option(2)$$

Question 4

Identification: Compound interest

$$i = n\left(\left(1+\frac{jm}{m}\right)^{\frac{m}{n}}-1\right)$$
$$with\ jm = 0,199$$
$$m = 4$$
$$n = 52$$
$$i = 52\left(\left(1+\frac{0,199}{4}\right)^{\frac{4}{52}}-1\right)$$
$$= 0,19457$$
$$= 19,46\% \qquad Option(2)$$

Question 5

Identification: Continuous compounding

$$J = 100\left(e^{0,175}-1\right)$$
$$= 19,12\% \qquad Option(5)$$

Question 6

Identification: Compounding

$$1.\ S = P(1+i)^n$$
$$= 10\,000\left(1+\frac{0,1065}{4}\right)^{4\times 7}$$
$$= 10\,000\left(1+\frac{0,1065}{4}\right)^{28}$$
$$= 20\,870,43$$
$$2.\ S = P(1+i)^n$$
$$= 25\,000\left(1+\frac{0,087}{12}\right)^{12\times\frac{52}{12}}$$
$$= 25\,000\left(1+\frac{0,087}{12}\right)^{52}$$
$$= 36\,398,07$$
$$\therefore Three\ years\ from\ now\ Pitso\ will\ owe\ Clive\left(36\,398,07+20\,870,43\right)$$
$$= 57\,268,50 \qquad Option(3)$$

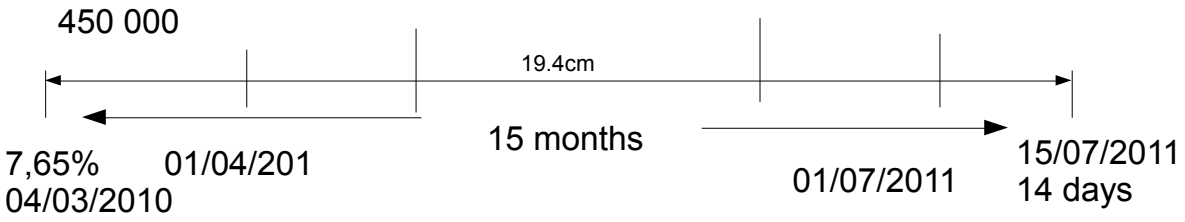
Question 7

Identification: Annuity due

$$S = (1+i)\,Rs\,\overline{n}|i$$
$$with\ 1 = 0,0858 \div 12$$
$$N = 10\times 12$$
$$S = 48\,000 \div \left(1+\frac{0,0858}{12}\right)$$
$$48\,000 = \left(1+\frac{0,0858}{12}\right) Rs\,\overline{10\times 12}|0,0858\div 12$$
$$R = 252,18 \qquad Option(1)$$

Question 8

Identification: Odd periods and compound interest



$$S = P(1+rt)\left(1+\frac{dm}{m}\right)(1+rt)$$

$$S = 450\,000\left(1+0,0765\times\frac{28}{365}\right)$$

$$= 452\,640,82$$

$$452\,640,82\left(1+\frac{0,0765}{12}\right)^{\frac{15}{12}\times 12}$$

$$= 479\,970,53$$

$$452\,640,82\left(1+0,0765\times\frac{14}{365}\right)$$

$$= 499\,371,53 \qquad Option(4)$$

Question 9

Identification: Fractional compounding

$$S = P\left(1+\frac{dm}{m}\right)^{tm}$$

$$S = 450\,000\left(1+\frac{0,0765}{12}\right)^{\left(\frac{15}{12}+\frac{28+14}{365}\right)\times\frac{12}{1}}$$

$$= 499\,368,28 \qquad Option(4)$$

Question 10

Identification: Continuous compounding

$$S = Pe^{ct}$$

$$S = 36\,550$$

$$P = 25\,500$$

$$t = \frac{54}{12}$$

$$36\,550 = 25\,500e^{\left(\frac{54}{12}c\right)}$$

$$e^{\left(\frac{54}{12}c\right)} = \frac{36\,550}{25\,500}$$

$$\frac{54}{12}c\ln e = \ln\left(\frac{36\,550}{25\,500}\right)\div\frac{54}{12}$$

$$c = \ln\left(\frac{35\,550}{25\,500}\right)\div\frac{54}{12}$$

$$= 8\% \qquad Option(2)$$

Question 11

Identification: Bond

$$Years = 17/04/2036 - 17/04/2012$$
$$= 24$$

Multiply with two and add one to get "n"

$$= 24 \times 2 + 1 = 49$$
$$R = 45$$
$$H = 183$$
$$P = \frac{9,75}{2} a\overline{49|}0,0795 \div 2 + 100\left(1 + \frac{0,0795}{2}\right)^{-49}$$
$$= 104,4813372 + 14,80752509$$
$$= 119,2888622 + 4,875 = 124,163622$$
$$All\ in\ price = 124,163622\left(1 + \frac{0,0795}{2}\right)^{-\frac{45}{183}}$$
$$= 122,9791 \qquad Option(4)$$

Question 12

Identification: Bond

$$Accrued\ \text{interest} = \frac{H - R}{365} \times C$$
$$= \frac{183 - 45}{365} \times 9,75$$
$$= 3,68630\% \qquad Option(3)$$

Question 13

Identification: Bond

$$\begin{aligned} Clean\ price &= All\ in\ price - Accrued\ \text{interest} \\ &= 122,97940 - 3,68630 \\ &= 119,29310 \qquad\qquad Option(5) \end{aligned}$$

Question 14

$$S = \left(R + \frac{Q}{i}\right)s\overline{n}|i - \frac{nQ}{i}$$

$R = 6000$

$Q = 1200$

$i = 9,5\%$

$n = 30$

$$\begin{aligned} S &= \left(6000 + \frac{1200}{0,095}\right)s\overline{30}|0,095 - \frac{30 \times 1200}{0,095} \\ &= 2788914,51 - 378947,37 \\ &= 2409967 \qquad\qquad Option(4) \end{aligned}$$

Question 15

$$\begin{aligned} Amount\ paid &= nR + Q\left(\frac{n(n-1)}{2}\right) \\ &= 30 \times 6000 + 1200\left(\frac{30 \times 29}{2}\right) \\ &= 180000 + 522000 \\ &= 702000 \qquad\qquad Option(1) \end{aligned}$$

Question 16

$$S = \left(R + \frac{Q}{i} \right) s\overline{n}|i - \frac{nQ}{i}$$

$$\frac{S + nQ}{s\overline{n}|i} = \frac{\left(R + \frac{Q}{i} \right) s\overline{n}|i}{s\overline{n}|i}$$

$$R + \frac{Q}{i} = S + \frac{nQ}{i}$$

$$R = \frac{S + \frac{nQ}{is\overline{n}|i} - \frac{n}{i}}{s\overline{n}|i} - \frac{nQ}{i}$$

$$R = \frac{S + \frac{Q}{i} s\overline{n}|i - n\frac{Q}{i}}{s\overline{n}|i} \qquad Option(2)$$

Question 17

$$\begin{aligned} &Interest\ due\ at\ end + \text{Pr}incipal\ repaid\ of\ month \\ &= 3081,86 + 1119,21 \\ &= 4201,07 \qquad Option(5) \end{aligned}$$

Question 18

$$\begin{aligned} &Outs\text{tan}ding\ principal at\ beginning\ of\ month + \text{Pr}incipal\ at\ end\ of\ month \\ &= 202152,34 + 199586,48 \\ &= 2583,85 \qquad Option(3) \end{aligned}$$

Question 19

$Outs\tan ding\ principal\ at\ beginning\ of\ month - \Pr incipal = Outs\tan ding\ principal\ at\ month\ end$
$= 118191,36 - 3255,54 = 114935,82$
$= 114935,82 = Month 150\ outs\tan ding\ principal\ at beginning\ of\ month \qquad Option(2)$

Question 20

Sample Option(5)

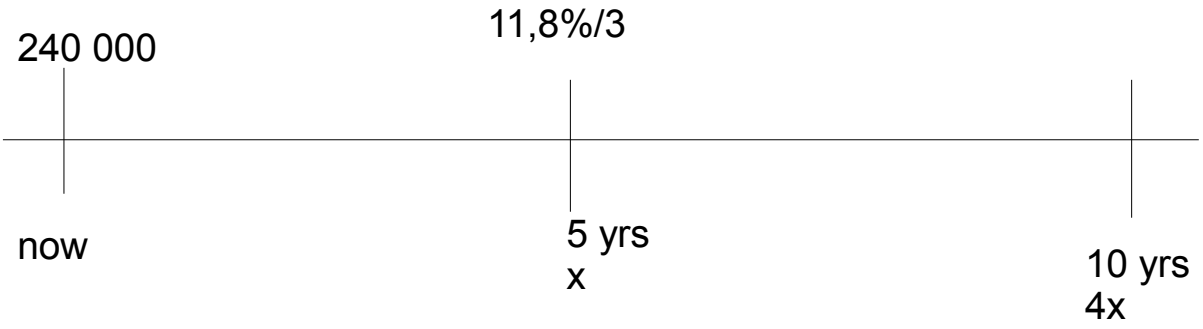
Question 21

$Calculator\ y = -1,9x + 22,6 \qquad Option(1)$

Question 22

$$P = \frac{R}{i}$$
$$R = 2500$$
$$i = 0,125 \div 5$$
$$= \frac{2500}{0,125 \div 12}$$
$$= 240000 \qquad Option(3)$$

Question 23



$$240\,000\left(1+\frac{0{,}118}{3}\right)^{3\times10}=x\left(1+\frac{0{,}118}{3}\right)^{15}+4x$$

$$763\,548{,}1864=x\left(5{,}783704229\right)$$

$$x=\frac{763\,548{,}1864}{5{,}783704229}$$

$$x=132\,023{,}38\times4$$

$$=528\,094 \qquad Option(4)$$

Question 24

$$Tv=Ra\,\overline{n}|i$$

$$=13\,981{,}97\,a\,\overline{20\times12}|0{,}064\div12$$

$$=1\,890\,227{,}99$$

$$\therefore Tr=Tv-P$$

$$=1\,890\,227{,}99-1\,500\,000$$

$$=390\,227{,}98 \qquad Option(3)$$

Question 25

$$PVout = 70\,000(1+0{,}115)^{-5} + 90\,000(1+0{,}115)^{-7} + 75\,000(1+0{,}115)^{-10}$$
$$= 40\,618 + 42\,007 + 25\,253$$
$$= 107\,878 \qquad Option(1)$$

Question 26

$$C = 150\,000(1+0{,}0870)^{5} + 120\,000$$
$$= 227\,634{,}97 + 120\,000$$
$$= 347\,634{,}97 \qquad Option(5)$$

Question 27

$$MIRR = \left(\frac{C}{PVout}\right)^{\left(\frac{1}{8}\right)} - 1$$
$$C = PVout(1+i)^{n}$$
$$= 291930(1+0{,}1081)^{8}$$
$$= 663\,606{,}095$$
$$= R663\,600 \qquad Option(4)$$

Question 28

$$Calculator = 22{,}11\% \qquad Option(5)$$

Question 29

$$S = p(1+i)^n$$

$$= 532978{,}19\left(1+\frac{0{,}079}{12}\right)^{3\times 12}$$

$$= 674993{,}989 \qquad 1$$

$$PMT = 60000$$

$$1/Y = 7{,}9\%$$

$$C/Y = 12$$

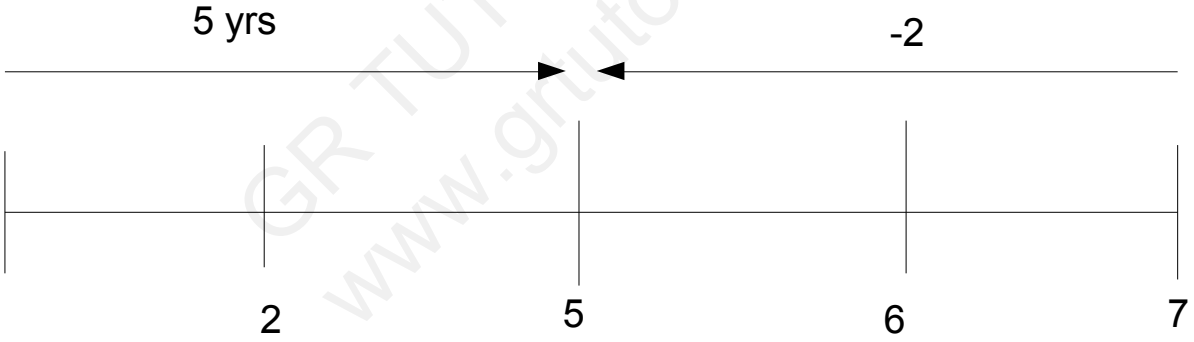
$$N = 3$$

$$P/Y = 12$$

$$FV = 2444456{,}79 \qquad 2$$

$$674993{,}989 + 2444456{,}79 = 3119450{,}78$$

Question 21

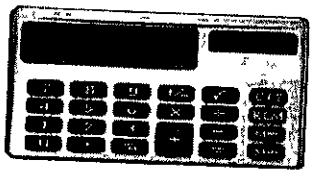


$$20000\left(1+\frac{0{,}104}{12}\right)^{5\times 12} + 35000\left(1+\frac{0{,}098}{4}\right)^{-2\times 4}$$

$$33565{,}27 + 28838{,}48$$

$$= R62403{,}75 \qquad Option(5)$$

UNIVERSITY EXAMINATIONS



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UNISA university of south africa

DSC1630 (477112) October/November 2011
RDS1630 (493230)

INTRODUCTORY FINANCIAL MATHEMATICS

Duration 2 Hours

100 Marks

EXAMINERS
FIRST MRS S ROTHMANN
SECOND MRS E MUDIMU

Programmable pocket calculator is permissible

This paper consists of 24 pages including a list of formulæ, a table with the number of each day of the year and 10 sheets of paper for rough work, plus instructions for completing a mark-reading sheet

Please complete the attendance register on the back page, tear it off and hand it to the invigilator.

Answer *all* questions on the mark-reading sheet supplied Follow the instructions for completing the mark-reading sheet carefully Also pay attention to the following

- Only one option (indicated as [1] [2] [3] [4] [5]) per question is correct Do not mark more than one option per question on the mark-reading sheet
- Marks will *not* be deducted for incorrect answers
- There are 30 questions for a total of 100 marks

You are strongly advised to write your name on the mark-reading sheet Then, if you have entered your student number incorrectly, we will still be able to link you to the mark-reading sheet.

Question 1

On 4 January 2011 Neville deposited R7 800 into a savings account The simple interest rate agreed upon was 6 2% per year The accumulated amount in the savings account on 21 November 2011 will equal

[1] R8 221 81
[2] R8 223,98
[3] R8 225,30
[4] R8 237,07
[5] R8 249,83

Question 2

A simple interest rate of 12% is equivalent to a simple discount rate of 9,6% The time under consideration is

[1] 10,33 months
[2] 18,75 months
[3] 20,83 months
[4] 25 months
[5] 31,25 months

Question 3

The O-So-Rich money lending company has a finance charge of 0 13% per week on outstanding balances The effective rate is

[1] 6,76%
[2] 6,99%
[3] 13,01%
[4] 13,86%
[5] 25%

Question 4

Paulina borrows money from the bank at a discount rate of 9,98% She must pay the bank back R35 000 in 30 months' time The amount of money that she receives from the bank *now* equals

[1] R27 592 04
[2] R28 011,20
[3] R43 732 50
[4] R46 635 58
[5] none of the above

Question 5

A continuous compounding rate of 10 56% is equivalent to a nominal rate per year, compounded every three months of

[1] 10,42%
[2] 10,56%
[3] 10 70%
[4] 11,14%
[5] none of the above

Question 6

Michelle must pay Johnson 27 months from *now* R35 000 She however decides to rather pay him 14 months from *now* If a simple interest rate of 10,2% per year is applicable then the amount Johnson will receive 14 months from *now* equals

[1] R28 466,86
[2] R31 132 50
[3] R31 277 93
[4] R31 517 33
[5] R31 854 41

Question 7

Sasha bought a persian carpet for R150 000 For the next 10 years the value of the carpet increased yearly by 12% and thereafter by 5% per year If she decides to sell the carpet after owning it for 21 years then the amount of money that she can expect to receive approximately equals

[1] R465 877
[2] R511 500
[3] R796 808
[4] R831 986
[5] R849 929

Question 8

On 16 February, Nazeed deposited R560 000 into an account that earns 6,93% interest per year, compounded monthly The interest is credited on the first day of the month Simple interest is used for odd periods and compound interest for full periods If fractional compounding is used then the balance in this account on 21 December of the same year will equal

[1] R592 641,30
[2] R593 371 35
[3] R593 483,69
[4] R593 511,78
[5] none of the above

Question 9

Kate needs to borrow R95 000 to pay for her refurbished bathroom She will pay it back over a five-year period An interest rate of 15,2% per year compounded monthly, is applicable Her monthly payment will equal

[1] R1 053 35
[2] R1 066,69
[3] R1 583,33
[4] R2 241 64
[5] none of the above

Question 10

Erica has invested R68 000 in an account earning 8,45% interest per year, compounded every three months. The accumulated amount after four years equals

[1] R90 984,00
[2] R94 064,80
[3] R94 901,08
[4] R95 010,47
[5] none of the above

Questions 11 and 12 relate to the following situation.

Consider Bond ABC	
Coupon rate	*9,4% per year*
Yield to maturity	*6,9% per year*
Settlement date	*19 December 2011*
Maturity date	*16 April 2031*

Question 11

The all-in price equals

[1] R98,68966%
[2] R123,50126%
[3] R126,24725%
[4] R128,09903%
[5] R130,94725%

Question 12

Petrus wants to sell 1 500 Bonds ABC on 19 December 2011. The amount of money (to the nearest rand) he can expect to receive equals

[1] R148 034
[2] R185 252
[3] R189 371
[4] R192 149
[5] R196 421

Questions 13 and 14 relate to the following situation:
Anika wants to go on a hiking trip around the world She decides to ask her famous Aunt Sophie to lend her money for the trip She also indicates that she will only be able to start paying her back when she returns from her trip, which will last three years Aunt Sophie agrees on condition that she pays her R15 000 every three months for a period of four years Money is worth 9% per year compounded quarterly

Question 13

The amount of money that Anika owes Aunt Sophie when she returns from her trip equals

[1] R156 221,68
[2] R199 689,47
[3] R204 033,33
[4] R240 000,00
[5] R285 080,97

Question 14

The amount of money that Aunt Sophie gave Anika when she went on her hiking trip equalled

[1] R109 427,94
[2] R119 613,86
[3] R139 875,83
[4] R152 895,94
[5] R180 000,00

Question 15

George wants to open the Gadget Shop in five years' time He deposits R300 000 into an account earning 10,4% interest per year, compounded monthly After three years he decides to deposit R7 000 into the same account every month The approximate balance in this account when George wants to open the Gadget Shop will equal

[1] R595 154
[2] R671 479
[3] R689 337
[4] R785 427
[5] R825 993

Questions 16 and 17 relate to the following situation:
The Gliding Fund must pay Weaver R18 000 every three months indefinitely as compensation. Money is worth 11,4% per year, compounded quarterly

Question 16

The opening balance of this fund approximately equals

[1] R157 895
[2] R474 536
[3] R631 579
[4] R1 105 351
[5] none of the above

Question 17

Weaver asks to reschedule the compensation in three payments: the first payment *now*, the second payment twice the size of the first payment four years from *now*, and the third payment three times the size of the first payment nine years from *now*. The Gliding Fund agrees on condition that the interest rate changes to 10,95% per year, compounded monthly. The amount to the nearest hundred rand that Weaver can expect to receive four years from *now* equals

[1] R184 800
[2] R369 600
[3] R557 510
[4] R864 000
[5] none of the above

Question 18

The present value of an annuity is R62 543,42. The time under consideration is 10 years and the applicable interest rate 16% per year, compounded monthly. The future value of this annuity equals

[1] R162 612,89
[2] R306 521,61
[3] R581 913,00
[4] R625 434,20
[5] R1 333 517 61

Questions 19 and 20 relate to the following situation.
A study was undertaken to determine how the re-sale value of a house is affected by the age of the house

Age of house (years) x	***Re-sale value (millions of rands)*** y
2	*2,4*
5	*3*
10	*4*
15	*3 8*
20	*5*

Expect a linear relationship between the age of the house and re-sale value of the house

Question 19

The slope of the regression line is

[1] −1,495
[2] 0,129
[3] 0,948
[4] 2,298
[5] 6 964

Question 20

The correlation coefficient equals

[1] −1,495
[2] 0,129
[3] 0 948
[4] 2,298
[5] 6,964

ROUGH WORK

Questions 21, 22 and 23 relate to the following situation:
The following table is an extract from the amortisation schedule for Fred's home loan over a 20-year period

Month	***Outstanding principal at beginning of the month***	***Interest due***	***Payment***	***Principal repaid***	***Principal at month end***
196	*R948 004 00*	*R8 690,04*	*A*	*R17 114,67*	*R930 889,33*

Question 21

The applicable interest rate is

[1] 9.26%
[2] 11,00%
[3] 11,20%
[4] 15,08%
[5] none of the above

Question 22

The size of his monthly payment equals

[1] R3 878,71
[2] R3 950,00
[3] R8 424,63
[4] R25 804,71
[5] none of the above

Question 23

The size of the loan (to the nearest hundred rand) equals

[1] R2 021 900
[2] R2 500 000
[3] R4 107 500
[4] R6 193 100
[5] none of the above

Questions 24 and 25 relate to the following situation.
Doreen will discharge a debt of R870 000 eight years from now *using the sinking fund method The debt's interest rate is 13,4% per year, compounded quarterly The sinking fund will earn interest at a rate of 9.2% per year, compounded monthly*

Question 24

The monthly deposit in the sinking fund will equal

[1] R5 102,65
[2] R6 166.12
[3] R9 062 50
[4] R15 582,62
[5] R18 538,10

Question 25

The total yearly cost to discharge the debt (rounded off to the nearest hundred rand) will equal

[1] R74 000
[2] R80 000
[3] R154 000
[4] R116 600
[5] R190 600

Question 26

The equation for the present value of Bond 123 on 11 November 2011 is given by

$$P(11/11/2011) = \frac{10{,}4}{2} a_{\overline{44}|0{,}0875-2} + 100\left(1 + \frac{0{,}0875}{2}\right)^{-44}$$

The fraction of the half year to be discounted back is

$$f = \frac{5}{184}$$

The clean price for Bond 123 equals

[1] R115 85656%
[2] R115 99903%
[3] R121 05052%
[4] R121,19145%
[5] R121,19299%

Question 27

The following table represents the expected cash flows of the Noise Makers Company The applicable interest rate is 7,6% per year

Year	Cash flows R
2	−400 000
4	300 000
6	−800 000
8	−750 000
9	900 000

The present value of the cash outflows equals

[1] R689 319,50
[2] R1 278 385,60
[3] R1 693 018,70
[4] R1 791 288,13
[5] R1 950 000,00

Question 28

The net present value (NPV) of the Cat Claw Shop is R38 199 and the profitability index (PI) is 1,2122 The initial investment in the shop approximately equals

[1] R31 512
[2] R38 199
[3] R46 305
[4] R180 000
[5] none of the above

Question 29

Conrad managed to secure a home loan for 20 years at 11,9% per year, compounded monthly His monthly payment is R17 505,96 An average inflation rate of 4,75% per year is expected The real cost of the loan equals

[1] R1 108 963
[2] R1 600 000
[3] R2 708 963
[4] R2 601 430
[5] none of the above

The number of each day of the year

FOR LEAP YEARS ADD ONE TO THE NUMBER OF EVERY DAY AFTER FEBRUARY 28

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	**1**
2	2	33	61	92	122	153	183	214	245	275	306	336	**2**
3	3	34	62	93	123	154	184	215	246	276	307	337	**3**
4	4	35	63	94	124	155	185	216	247	277	308	338	**4**
5	5	36	64	95	125	156	186	217	248	278	309	339	**5**
6	6	37	65	96	126	157	187	218	249	279	310	340	**6**
7	7	38	66	97	127	158	188	219	250	280	311	341	**7**
8	8	39	67	98	128	159	189	220	251	281	312	342	**8**
9	9	40	68	99	129	160	190	221	252	282	313	343	**9**
10	10	41	69	100	130	161	191	222	253	283	314	344	**10**
11	11	42	70	101	131	162	192	223	254	284	315	345	**11**
12	12	43	71	102	132	163	193	224	255	285	316	346	**12**
13	13	44	72	103	133	164	194	225	256	286	317	347	**13**
14	14	45	73	104	134	165	195	226	257	287	318	348	**14**
15	15	46	74	105	135	166	196	227	258	288	319	349	**15**
16	16	47	75	106	136	167	197	228	259	289	320	350	**16**
17	17	48	76	107	137	168	198	229	260	290	321	351	**17**
18	18	49	77	108	138	169	199	230	261	291	322	352	**18**
19	19	50	78	109	139	170	200	231	262	292	323	353	**19**
20	20	51	79	110	140	171	201	232	263	293	324	354	**20**
21	21	52	80	111	141	172	202	233	264	294	325	355	**21**
22	22	53	81	112	142	173	203	234	265	295	326	356	**22**
23	23	54	82	113	143	174	204	235	266	296	327	357	**23**
24	24	55	83	114	144	175	205	236	267	297	328	358	**24**
25	25	56	84	115	145	176	206	237	268	298	329	359	**25**
26	26	57	85	116	146	177	207	238	269	299	330	360	**26**
27	27	58	86	117	147	178	208	239	270	300	331	361	**27**
28	28	59	87	118	148	179	209	240	271	301	332	362	**28**
29	29		88	119	149	180	210	241	272	302	333	363	**29**
30	30		89	120	150	181	211	242	273	303	334	364	**30**
31	31		90		151		212	243		304		365	**31**

FORMULÆ

$$I = Prt$$

$$S = P(1 + rt)$$

$$P = S(1 - dt)$$

$$S = P\left(1 + \frac{j_m}{m}\right)^{tm}$$

$$J_{eff} = 100\left(\left(1 + \frac{j_m}{m}\right)^{m} - 1\right)$$

$$S = Pe^{cl}$$

$$j_\infty = 100(e^c - 1)$$

$$c = m\ln\left(1 + \frac{j_m}{m}\right)$$

$$j_m = m\left(e^{\frac{c}{m}} - 1\right)$$

$$i = n\left(\left(1 + \frac{j_m}{m}\right)^{\frac{m}{n}} - 1\right)$$

$$S = R\left(\frac{(1+i)^n - 1}{i}\right)$$

$$S = Rs_{\overline{n}|i}$$

$$P = Ra_{\overline{n}|i}$$

$$P = R\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$$

$$A = nR + Q\left[\frac{n(n-1)}{2}\right]$$

$$r = \frac{d}{1 - dt}$$

$$S = (1+i)Rs_{\overline{n}|i}$$

$$P = (1+i)Ra_{\overline{n}|i}$$

$$P = da_{\overline{n}|z} + 100(1+z)^{-n}$$

$$\frac{H - R}{365} \times c$$

$$\frac{-R}{365} \times c$$

$$MIRR = \left(\frac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$$

$$P = \frac{R}{i}$$

$$S = \left[R + \frac{Q}{i}\right]s_{\overline{n}|i} - \frac{nQ}{i}$$

$$T_i = Ra_{\overline{n}|i} - P$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

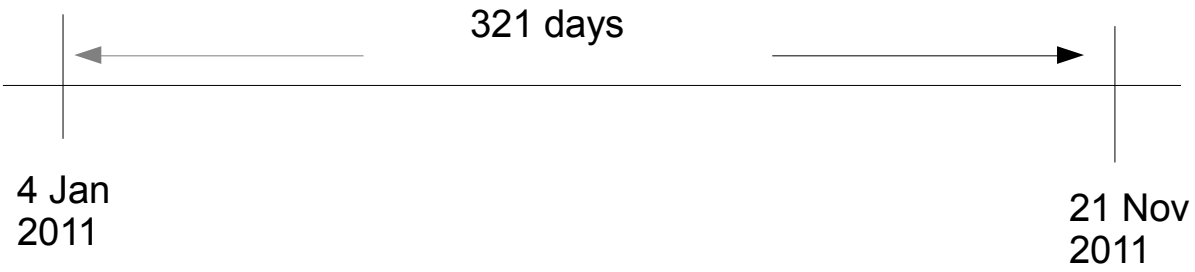
$$\bar{x}_w = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$S = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

OCTOBER/NOVEMNER 2011

1. Identification: Simple interest



$$S = P(1+rt)$$
$$= 7\,800\left(1+0,062\times\frac{321}{365}\right)$$
$$= R8\,252,30 \qquad Option(1)$$

2.

$$t = \frac{1-\frac{d}{r}}{d}$$
$$= \frac{1-\frac{0,096}{0,12}}{0,096}$$
$$time = 25\,months$$
$$Option(4)$$

3. Identification: Nominal and effective interest rates

$$jeff = \left[\left(1+\frac{jm}{m}\right)^{m}-1\right]$$
$$= \left[\left(1+\frac{0,13}{52}\right)^{52}-1\right]$$
$$= 13,01\%$$
$$Option(3)$$

4.

$$P = S(1 - dt)$$
$$= 35\,000\left(1 - 0,0998 \times \frac{30}{12}\right)$$
$$= R26\,267,50$$
$$Option(5)$$

5.

$$jm = m\left(e^{\frac{c}{m}} - 1\right)$$
$$= 4\left(e^{\frac{0,1056}{4}} - 1\right)$$
$$= 10,7\%$$

6. Identification: Simple interest

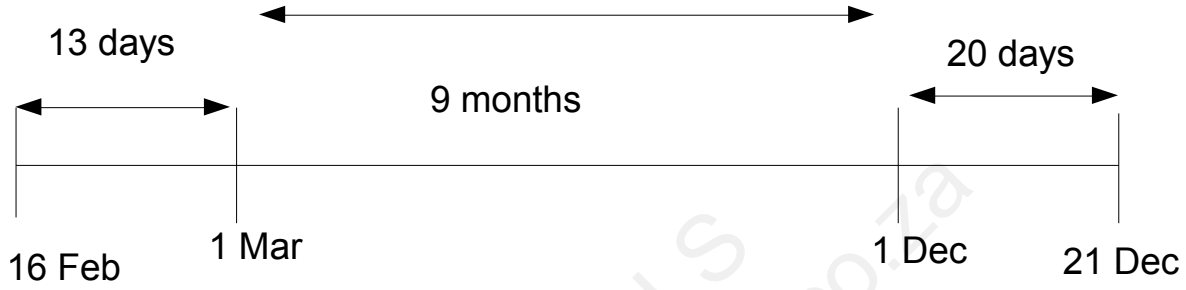
$$P = \frac{S}{1 + rt}$$
$$= \frac{35\,000}{1 + 0,102 \times \frac{27 - 14}{12}}$$
$$= R31\,517,33$$
$$Option(4)$$

7. Identification

$$= 150\,000 \times \left(1,12^{10}\right) \times \left(1,05^{11}\right)$$
$$= R796\,808[3]$$
$$Option(3)$$

8. Identification: Fractional Compounding

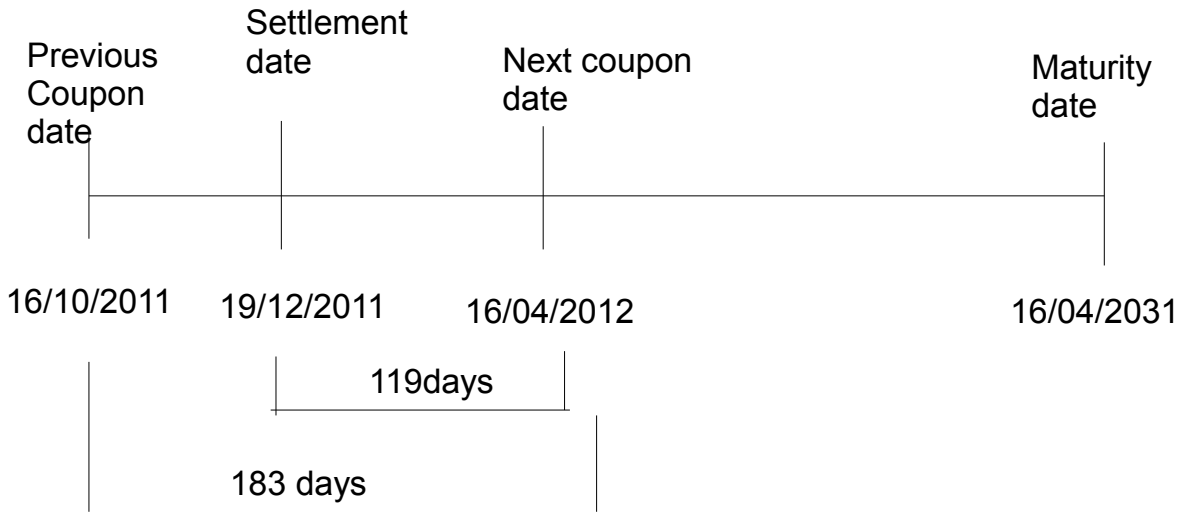
$$S = P(1+i)^n$$
$$= 560\,000\left(1+\frac{0,0693}{12}\right)^{\left(\left(\frac{13+20}{365}+\frac{9}{12}\right)\times 12\right)}$$
$$= R59348,69 \qquad Option(3)$$



10. Identification: Compounding interest

$$S = P(1+i)^n$$
$$= 68\,000\left(1+\frac{0,0845}{4}\right)^{4\times 4}$$
$$= R95\,010,47$$
$$Option(4)$$

11. Bond: Identification



$$19 \times 12 = 38$$

$$H = 183$$

$$R = 119$$

$$PMT = \frac{9,4}{2}$$

$$= 4,7$$

$$\frac{9,4}{2} a\overline{38}|0,069 \div 2 + 100\left(1 + \frac{0,069}{2}\right)^{-38}$$

$$= 98,68966 + 27,55759$$

$$= 126,24725 + 4,7$$

$$= 130,94725$$

$$= 130,94725\left(1 + \frac{0,069}{2}\right)^{-\left(\frac{119}{183}\right)}$$

$$= R128,09903\%$$

$$Option(4)$$

12. Identification: Bond

$$All\ in\ price \times no.of\ Bonds = Amount\ to\ be\ received$$

$$R128,09903 \times 1500 = R192149$$

$$Option(4)$$

13. Identification: Deferred annuity

$$PV = Ra\overline{n}|i\left(1+\frac{jm}{m}\right)^{-tm}$$
$$= 15\,000\,a\overline{4\times 4}|0,09\div 4\left(1+\frac{0,09}{4}\right)^{-3\times 4}$$
$$= R199\,689,47$$
$$Option(2)$$

14. Identification: Deferred annuity

$$PV = S\left(1+\frac{c}{dy}\right)^{-n\times dy}$$
$$= 199\,689,47\left(1+\frac{0,09}{4}\right)^{-4\times 3}$$
$$= R152\,895,73$$
$$Option(4)$$

15. Identification:

$$PV = P(1+i)^{n}$$
$$= 300\,000\left(1+\frac{0,104}{12}\right)^{12\times 5}$$
$$= R505\,479,04$$
$$S = Rs\overline{n}|i\left(1+\frac{jm}{m}\right)^{m\times n}$$
$$= 7\,000\overline{2\times 12}|\left(1+\frac{0,104}{12}\right)^{12\times 2}$$
$$= R185\,858,32$$
$$Total\ value = 503\,479,04+185\,858,32$$
$$= R689\,337$$
$$Option(3)$$

16. Identification: Perpetuity

$$P = \frac{R}{L}$$
$$= \frac{18\,000}{0{,}114 \div 4}$$
$$= R631\,579$$
$$Option(3)$$

17. Identification:

$$Payments = Obligations$$
$$\times\left(1+\frac{0{,}1095}{12}\right)^{12\times 4} + 2x + 3x\left(1+\frac{0{,}1095}{12}\right)^{-12\times 5} = 631\,579\left(1+\frac{0{,}1095}{12}\right)^{12\times 4}$$
$$1{,}546529981x + 2x + 1{,}739495563 = R976\,755{,}86$$
$$\frac{5{,}286025544x}{5{,}286025544} = \frac{976\,755{,}86}{5{,}286025544}$$
$$x = 184\,780{,}77$$
$$2x(x\times 2)184\,780{,}77\times = R369\,600$$
$$Option(2)$$

18. Identification: Annuity

$$FV = P(1+i)^{n}$$
$$= 62\,543{,}42\left(1+\frac{0{,}16}{12}\right)^{12\times 10}$$
$$= R306\,521{,}61$$
$$Option(2)$$

19. Identification: Slope of regression

Financial calculator
rcl b
$b, slope = 0,129$
$Option(2)$

20. Identification: Correlation coefficient

Financial calculator
rcl r
$r = 0,948$
$Option(3)$

21. Identification: Amortisation

$$Interest\ rate = \frac{\text{int}\, erest\ due}{outs\,\text{tan}\, ding\ principle} \times compounding\ periods$$
$$= \frac{R8\,690,04}{R948\,004} \times 12$$
$$= 0,00916667 \times 12$$
$$= 0,11 \times 100$$
$$= 11\%$$
$Option(2)$

22. Identification: Amortisation

$$payment = \text{int}\, ersest\ due + principal\ repaid$$
$$= R8\,690,04 + 17114,67$$
$$= R25\,804,71$$
$Option(4)$

23. Identification: Amortisation

$$PV = Ra\overline{n}|i\left(1+\frac{jm}{m}\right)^{-tm}$$

$$= 25804,71a\overline{20\times12}|0,11\div12\left(1+\frac{0,11}{4}\right)^{-20\times12}$$

$$PV = R2\,500\,000$$

$$Option(2)$$

24. Identification: Sinking funds

$$S = Rs\overline{n}|i$$

$$870\,000 = s$$

$$\therefore R = \frac{870\,000}{\overline{58\times12}|0,092\div12}$$

$$= R6166,12$$

$$Option(3)$$

25. Identification: Sinking funds

$$S1 = \Pr t$$

$$= 870\,000\times0,134\times\frac{3}{12}$$

$$= R29145$$

$$Total\ yearly\cos t = 4\times29145+12\times1166,12$$

$$= R190\,573\ to\ the\ nearest\ hundred$$

$$= R190\,600$$

$$Option(5)$$

26. Identification: Bond

$$PMT = \frac{10,4}{12} = 5,2$$

$$\Pr ice = 100\left(1 + \frac{0,0875}{2}\right)^{-44}$$

$$PV = p/y = 2, c/y = 2, PMT = 5,2, 1/y = 8,75, n = 22$$

$$= R100,7945625$$

$$Current\ price = PV + \Pr ice$$

$$= 115,9914448$$

$$All\ in\ price = 115,8565584$$

$$A1 = \frac{-5}{365} \times 10,4 = -0,14246753$$

$$Clean\ price = All\ in\ price + Acrued\ \text{int}erest$$

$$= 115,99903\%$$

$$Option(2)$$

27. Identification; MIRR (Evaluation of cash flows)

$$PVout = 400\,000(1+0,076)^{-2} + 800\,000(1+0,076)^{-6}$$

$$= 750\,000(1+0,076)^{-8}$$

$$= R1\,278\,385,60$$

$$Option(2)$$

28. Identification: Profitability index

$$P1 = \frac{NPV + 1}{1}$$

$$1,2122 = \frac{38199 + x}{x}$$

$$1,2122x = 38199x$$

$$1,2122x - x = 38199$$

$$\frac{0,2122x}{0,2122} = \frac{38199}{0,2122}$$

$$x = 180\,014,14$$

$$= R180\,000$$

$$Option(4)$$

29.

$$PV = Ra\overline{n}|i\left(1+\frac{jm}{m}\right)^{-tm}$$

$$= 17\,505,96a\overline{12\times 20}|0,0475\div 12\left(1+\frac{0,0475}{12}\right)^{-20\times 12}$$

$$Total\ value = R2\,708\,963,159$$

$$Original\ value = 17\,505,96\,a\overline{12\times 20}|0,0475\div 12\left(1+\frac{0,0475}{12}\right)^{-20\times 12}$$

$$= R1\,600\,000$$

$$Total\ real\cos t = Total\ value - original\ value$$

$$= 2\,708\,963,159 - 1\,600\,000$$

$$= R1\,108\,963$$

$$Option(1)$$

30.

$If\ S = Rs\overline{n}|i \qquad \therefore n$

$$s = R\left[\frac{(1+i)^{n-1}}{i}\right]$$

$$\frac{s}{R} = \frac{R\left[\frac{(1+i)^{n-i}}{i}\right]}{R}$$

$$R\left[\frac{(1+i)^{n-i}}{i}\right] = \frac{S}{R}$$

$$\frac{(1+i)^{n}}{i} = \frac{S}{R} + 1$$

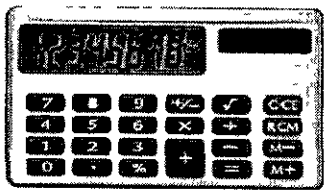
$$(1+i)^{n} = \left(i\frac{S}{R} + 1\right)$$

$$\frac{\ln(1+i)n}{\ln(1+i)} = \frac{\ln\left(i\frac{S}{R}+1\right)}{\ln(1+i)}$$

$$n = \frac{\ln\left(i\frac{S}{R}+1\right)}{\ln(1+i)}$$

$Option(2)$

UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (490770) May/June 2012

DEPARTMENT OF DECISION SCIENCES
INTRODUCTORY FINANCIAL MATHEMATICS

Duration 2 Hours 100 Marks

EXAMINERS

FIRST MRS MF IMMELMAN
SECOND DR MP MULAUDZI

Programmable pocket calculator is permissible

This examination question paper remains the property of the University of South Africa and may not be removed from the examination venue

This paper consists of 25 pages including a list of formulæ, a table with the number of each day of the year and 11 sheets of paper for rough work plus instructions for completing a mark-reading sheet

Please complete the attendance register on the back page, tear it off and hand it to the invigilator.

Answer *all* questions on the mark-reading sheet supplied Follow the instructions for completing the mark-reading sheet carefully Also pay attention to the following

- Only one option (indicated as [1] [2] [3] [4] [5]) per question is correct Do not mark more than one option per question on the mark-reading sheet
- Marks will *not* be deducted for incorrect answers
- There are 30 questions for a total of 100 marks

You are strongly advised to write your name on the mark-reading sheet Then, if you have entered your student number incorrectly, we will still be able to link you to the mark-reading sheet

[TURN OVER]

Question 1

If R400 accumulates to R460 at a simple interest rate of 8% per year, then the length of time of the investment is given by the expression

[1] $\left(\frac{460}{400} - 1\right) \times \frac{1}{0{,}08}$

[2] $\left(\frac{460}{400} - 1\right) \times 0{,}08$

[3] $\left(\frac{460}{400} + 1\right) \times \frac{1}{0{,}08}$

[4] $\left(\frac{460}{400} + 1\right) \times 0{,}08$

[5] $\left(1 - \frac{460}{400}\right) \times 0{,}08$

Question 2

If interest on money is earned at 10,5% per year, compounded monthly, the principal will triple in

[1] 6,35 years

[2] 10,5 years

[3] 19 years

[4] 126 years

[5] none of the above

Question 3

An amount of R20 000 is invested in a fund that pays 12% simple interest per year The total amount in this fund after 126 months will equal

[1] R25 200,00

[2] R45 200,00

[3] R70 068,54

[4] R70 508,43

[5] R76 923,08

Question 4

If $R = \dfrac{x}{s_{\overline{18}|0,15}}$ is simplified, then the equation becomes

[1] $R = x$

[2] $R = 0{,}01319x$

[3] $R = 0{,}16319x$

[4] $R = 6{,}12797x$

[5] $R = 75{,}83638x$

Question 5

Mike deposits R1 500 at the end of every month into an account that earns 12,5% interest per year, compounded monthly. After two years, he stops making these monthly contributions because the interest rate changes to 15% per year, compounded every two months. If no withdrawals or deposits are made for four years the balance in the account will equal

[1] R40 660,72

[2] R62 224,96

[3] R65 114,13

[4] R72 517,49

[5] none of the above

Question 6

The future value of an annuity is R430 451. The applicable interest rate is 8,4% per year, compounded quarterly. The time under consideration is 10 years. The present value of this annuity approximately equals

[1] R9 039

[2] R10 761

[3] R187 454

[4] R988 447

[5] none of the above

Questions 7 and 8 relate to the following situation:
Sylvia wants to open the Granny Shop and on 6 November 2011, she invests R300 000 into an account earning 9,25% interest per year, compounded monthly Interest is credited on the first day of every month Sylvia will move into the Granny Shop on 17 July 2012

Question 7

If simple interest is used for odd period calculations and compound interest for the full period, then the amount of money that Sylvia has available on 17 July 2012 is

[1] R318 572,33
[2] R319 310,96
[3] R319 783,52
[4] R319 864,07
[5] R319 867,07

Question 8

If fractional compounding is used for the full period, then the amount that Sylvia has available on 17 July 2012 is

[1] R319 310,96
[2] R319 813,24
[3] R319 860,34
[4] R319 867,07
[5] none of the above

Question 9

Ester is getting married 16 months from *now* and estimates that she will need R45 000 for new clothes for her honeymoon She starts to save *immediately* by depositing R2 200 every month for 16 months into an account earning 15,4% interest per year, compounded monthly The amount that she still needs when she gets married is denoted by

[1] $X = 45\,000 - 2\,200a_{\overline{16}|0,154-12}$
[2] $X = 45\,000 - 2\,200s_{\overline{16}|0,154-12}$
[3] $X = 45\,000 - (1+i)2\,200a_{\overline{16}|0,154-12}$
[4] $X = 45\,000 - (1+i)2\,200s_{\overline{16}|0,154-12}$
[5] $X = 45\,000 - 2\,200s_{\overline{17}|0,154-12}$

Questions 10, 11 and 12 relate to the following situation:

Consider BOND ABC	
Coupon rate	*9,4% per year*
Yield to maturity	*10,6% per year*
Settlement date	*16 July 2012*
Maturity date	*9 October 2038*

Question 10

The all-in price will equal

[1] R82,63215%

[2] R87,33105%

[3] R89,45121%

[4] R91,91965%

[5] R94,15121%

Question 11

The accrued interest equals

[1] R2,18904%

[2] R2,51694%

[3] R2,52384%

[4] R4,36612%

[5] none of the above

Question 12

The clean price equals

[1] R84,80721%

[2] R86,92737%

[3] R87,26217%

[4] R89,39581%

[5] R89,73061%

Question 13

The MIRR of the Copy and Make Shop over a time period of 10 years is 32,7% The present value of the cash outflows is R20 514 Therefore the value of the cash inflows approximately equals

[1] R205 140
[2] R347 344
[3] R670 808
[4] R691 321
[5] none of the above

Question 14

An investment of R200 000 in the Cup Cake Shop will have the following expected after-tax income per year

Year	Income (rand)
1	45 000
2	50 000
3	60 000
4	55 000
5	50 000

The average rate of return (ARR) on this investment will equal

[1] 5,4%
[2] 6,0%
[3] 9,2%
[4] 26%
[5] none of the above

Question 15

The positive square root of the is called the standard deviation The missing word is

[1] coefficient
[2] correlation
[3] coefficient of determination
[4] sample
[5] variance

Questions 16 and 17 relate to the following situation:
John buys a house and makes a down payment of 16% of the price of the house. For the remaining amount, he manages to secure a loan at an interest rate of 12,05% per year, compounded monthly, for a period of 20 years. His monthly payment is R18 556,84

Question 16

The size of the loan (to the nearest rand) equals

[1] R1 333 820
[2] R1 680 000
[3] R2 167 317
[4] R4 453 642
[5] none of the above

Question 17

The down payment equals

[1] R213 411
[2] R254 061
[3] R268 800
[4] R320 000
[5] R346 771

Question 18

Levy buys a house and manages to secure a home loan for R950 000 with monthly payments of R10 833,54 at a fixed interest rate of 12 56% per year compounded monthly, over a period of 20 years. If an average inflation rate of 6,8% is expected, then the real cost of the loan approximately equals

[1] R469 230
[2] R950 000
[3] R1 180 820
[4] R1 419 230
[5] R1 650 050

Questions 19 and 20 relate to the following situation:
The Treasure Fund was created for Long John after he lost his leg in a battle with pirates The fund has undertaken to pay him R19 000 every second month indefinitely

Question 19

If an interest rate of 9,5% per year, compounded every second month, is applicable, then the opening balance of the fund equals

[1] R1 189 224
[2] R1 200 000
[3] R2 000 000
[4] R2 115 882
[5] R2 400 000

Question 20

Long John prefers to receive three payments one three years from *now*, one twice the size of the first payment six years from *now* and one four times the size of the first payment ten years from *now* The amount of money to the nearest rand that John can expect to receive six years from *now* if the interest rate changes to 8,6% per year, compounded quarterly, will equal

[1] R325 803
[2] R333 235
[3] R651 606
[4] R666 470
[5] R1 303 212

Question 21

Two years ago, Vicky borrowed R20 000 from Jana to be paid back three years from *now* The applicable interest rate is 10,4% per year, compounded monthly She must also pay Jana R35 000 five years from *now* The applicable interest rate for this transaction is 9,8% per year, compounded every three months The amount of money that Vicky must pay Jana three years from *now* to settle her debt will equal

[1] R55 000,00
[2] R58 773,51
[3] R59 664,21
[4] R60 906,81
[5] R62 403,75

Questions 22 and 23 relate to the following situation:
Carin wants to open the Straight Hair Salon and asks her Aunt Wilma if she will lend her the money She also indicates that she will only be able to start paying her back after five years, at which time she will then pay R35 000 at the end of every four months, for four years Aunt Wilma agrees, on the condition that her money must earn 12,2% interest per year, compounded every four months

Question 22

The present value of Carin's debt will equal

[1] R387 335,79
[2] R420 000,00
[3] R437 962,78
[4] R518 312,63
[5] none of the above

Question 23

The amount that Aunt Wilma lends Carin equals

[1] R179 950,37
[2] R202 809,21
[3] R213 016,36
[4] R240 147,06
[5] R284 205,10

Question 24

An amount of money accumulates to R45 946 at a continuous compounding rate of 8% after 57 months The original amount equals

[1] R28 486,52
[2] R31 420,70
[3] R31 460,34
[4] R33 294,20
[5] R36 756,80

Questions 25 and 26 relate to the following situation:
The following table shows the number of investors that invested a certain amount at a specific interest rate

Number of investors	***Amount invested***	***Interest rate per annum***
125	*R10 000*	*8,5%*
130	*R12 000*	*8,75%*
80	*R15 000*	*9,00%*
145	*R20 000*	*11,00%*
110	*R25 000*	*11,50%*
90	*R30 000*	*11,75%*
50	*R100 000*	*12,00%*

Question 25

The weighted average interest rate on the amounts invested equals

[1] 10.19%
[2] 10,35%
[3] 10,84%
[4] 11,25%
[5] 11,9%

Question 26

The linear relationship between the number of investments (x) made and the interest rates (y) can be represented by the regression line

[1] $y = -8{,}66x + 193{,}95$
[2] $y = -0{,}019x + 12{,}33$
[3] $y = 10{,}36x + 104{,}29$
[4] $y = 12{,}33x - 0{,}019$
[5] $y = 193{,}95x - 8{,}66$

Questions 27 and 28 relate to the following situation:
A debt that is discharged by means of the sinking fund method has a monthly payment of R7 665,25 over a period of six years The fund will earn 11,9% interest per year, compounded monthly The debt interest is 15,6% per year, paid every three months

Question 27

The debt equals

[1] R118 077,60
[2] R295 760,82
[3] R393 125,45
[4] R551 898,00
[5] R800 000,00

Question 28

The total yearly cost of the debt will equal

[1] R91 983
[2] R124 800
[3] R133 583
[4] R187 183
[5] R216 783

Question 29

The settlement date of Bond E528 is 23 May 2013
The price on the coupon date that follows the settlement date is denoted by

$$P = \frac{12{,}4}{2} a_{\overline{n}|0{,}108-2} + 10{,}41966$$

and

$$\text{the all-in price} = 119{,}47116 \left(1 + \frac{0{,}108}{2}\right)^{-20/182}$$

The maturity date of Bond E528 is

[1] 12 June 2034
[2] 25 November 2034
[3] 12 December 2034
[4] 23 November 2041
[5] 12 December 2041

Question 30

The following table represents the expected cash flows for the Shop and Pay Company The applicable interest rate is 7,99% per year

Year	Cash flows R
2	+300 000
4	−100 000
6	+400 000
9	−900 000
10	+200 000

The present value of the cash outflows will approximately equal

[1] R14 107

[2] R524 130

[3] R807 249

[4] R871 748

[5] R1 000 000

The number of each day of the year

FOR LEAP YEARS, ADD ONE TO THE NUMBER OF EVERY DAY AFTER FEBRUARY 28

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	**1**
2	2	33	61	92	122	153	183	214	245	275	306	336	**2**
3	3	34	62	93	123	154	184	215	246	276	307	337	**3**
4	4	35	63	94	124	155	185	216	247	277	308	338	**4**
5	5	36	64	95	125	156	186	217	248	278	309	339	**5**
6	6	37	65	96	126	157	187	218	249	279	310	340	**6**
7	7	38	66	97	127	158	188	219	250	280	311	341	**7**
8	8	39	67	98	128	159	189	220	251	281	312	342	**8**
9	9	40	68	99	129	160	190	221	252	282	313	343	**9**
10	10	41	69	100	130	161	191	222	253	283	314	344	**10**
11	11	42	70	101	131	162	192	223	254	284	315	345	**11**
12	12	43	71	102	132	163	193	224	255	285	316	346	**12**
13	13	44	72	103	133	164	194	225	256	286	317	347	**13**
14	14	45	73	104	134	165	195	226	257	287	318	348	**14**
15	15	46	74	105	135	166	196	227	258	288	319	349	**15**
16	16	47	75	106	136	167	197	228	259	289	320	350	**16**
17	17	48	76	107	137	168	198	229	260	290	321	351	**17**
18	18	49	77	108	138	169	199	230	261	291	322	352	**18**
19	19	50	78	109	139	170	200	231	262	292	323	353	**19**
20	20	51	79	110	140	171	201	232	263	293	324	354	**20**
21	21	52	80	111	141	172	202	233	264	294	325	355	**21**
22	22	53	81	112	142	173	203	234	265	295	326	356	**22**
23	23	54	82	113	143	174	204	235	266	296	327	357	**23**
24	24	55	83	114	144	175	205	236	267	297	328	358	**24**
25	25	56	84	115	145	176	206	237	268	298	329	359	**25**
26	26	57	85	116	146	177	207	238	269	299	330	360	**26**
27	27	58	86	117	147	178	208	239	270	300	331	361	**27**
28	28	59	87	118	148	179	209	240	271	301	332	362	**28**
29	29		88	119	149	180	210	241	272	302	333	363	**29**
30	30		89	120	150	181	211	242	273	303	334	364	**30**
31	31		90		151		212	243		304		365	**31**

FORMULÆ

$$I = Prt$$

$$S = P(1 + rt)$$

$$P = S(1 - dt)$$

$$S = P\left(1 + \frac{j_m}{m}\right)^{tm}$$

$$J_{eff} = 100\left(\left(1 + \frac{j_m}{m}\right)^{m} - 1\right)$$

$$S = Pe^{ct}$$

$$j_\infty = 100(e^c - 1)$$

$$c = m\ln\left(1 + \frac{j_m}{m}\right)$$

$$j_m = m\left(e^{\frac{c}{m}} - 1\right)$$

$$i = n\left(\left(1 + \frac{j_m}{m}\right)^{\frac{m}{n}} - 1\right)$$

$$S = R\left(\frac{(1+i)^n - 1}{i}\right)$$

$$S = Rs_{\overline{n}|i}$$

$$P = Ra_{\overline{n}|i}$$

$$P = R\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$$

$$A = nR + Q\left[\frac{n(n-1)}{2}\right]$$

$$r = \frac{d}{1 - dt}$$

$$S = (1+i)Rs_{\overline{n}|i}$$

$$P = (1+i)Ra_{\overline{n}|i}$$

$$P = da_{\overline{n}|z} + 100(1+z)^{-n}$$

$$\frac{H - R}{365} \times c$$

$$\frac{-R}{365} \times c$$

$$MIRR = \left(\frac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$$

$$P = \frac{R}{i}$$

$$S = \left[R + \frac{Q}{i}\right]s_{\overline{n}|i} - \frac{nQ}{i}$$

$$T_r = Ra_{\overline{n}|r} - P$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$\bar{x}_w = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$S = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

MAY/JUNE 2012 SOLUTION

Question 1

Identification: Simple interest

$$t = \frac{1}{\text{Pr}}$$
$$= \frac{460-400}{400\times 0,08} \ \ or \ \ \frac{60}{400\times 0,08}$$
$$t = \left(\frac{460}{400}-1\right)\times\frac{1}{0,08}$$
$$option(1)$$

Question 2

$$Take\, 100\, as\, PV$$
$$Take\, 300\, as\, FV$$
$$Interest = 10,5\%$$
$$C/Y = 12$$

$$300 = 100\left(1+\frac{0,105}{12}\right)^{12\times n}$$
$$n = 10,5\, years \qquad "Calculator"$$
$$Option(2)$$

Question 3

$$S = P(1+rt)$$
$$= 20\,000\left(1+0,12\times\frac{126}{12}\right)$$
$$= 45\,200$$
$$Option(2)$$

Question 4

$$R = \frac{x}{5\overline{18}|0,15}$$
$$= S\overline{n}|i$$
$$S\overline{n}|\ is\ equivalent\ /\ the\ same\ as \left(\frac{(1+i)^n - 1}{i}\right)$$
$$\therefore \left(\frac{(1+0,15)^{18} - 1}{0,15}\right) = 75,83638$$
$$R = 75,83638$$
$$Option(5)$$

Question 5

$$S = Rs\overline{n}|i$$
$$= R\left(\frac{(1+i)^n - 1}{i}\right)$$
$$= 1500\left(\frac{\left(1+\frac{0,125}{12}\right)^{2\times 12} - 1}{\frac{0,125}{12}}\right)$$
$$= 40\,660,72$$
$$\therefore S = P(1+i)^n$$
$$= 40\,660,72\left(1+\frac{0,15}{6}\right)^{2\times 6}$$
$$= 54\,684,15$$
$$Option(5)$$

Question 6

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

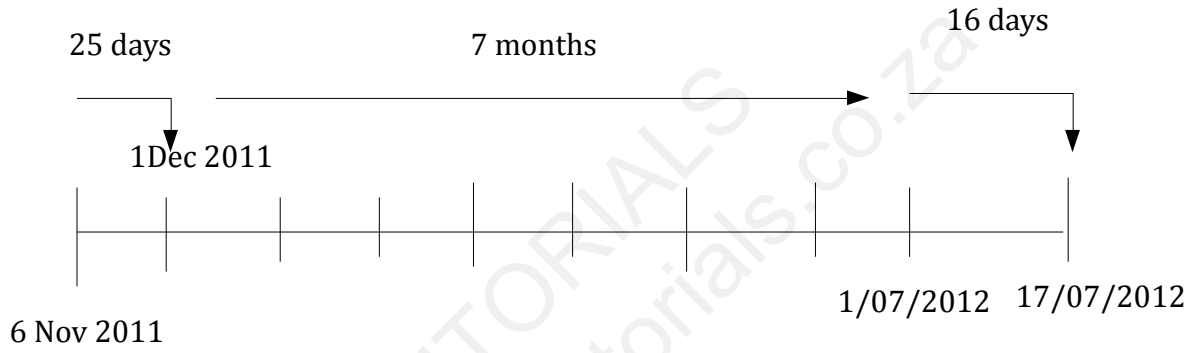
$$P = \frac{S}{(1+i)^n}$$

$$= \frac{430\,451}{\left(1+\frac{0,084}{4}\right)^{4\times 10}}$$

$$= 187\,454$$

$$Option(3)$$

Question 7



$$300\,000\left(1+0,0925\times\frac{25}{365}\right) = 301900,68$$

$$301900,68\left(1+\frac{0,0925}{12}\right)^{\frac{7}{12}\times 12} = 318\,572,32$$

$$318\,572,32\left(1+0,0925\times\frac{16}{365}\right) = 319\,864,07$$

$$319\,864,07$$

$$Option(4)$$

Question 8

$$300\,000\left(1+\frac{0,0925}{12}\right)\left(\frac{17}{12}+\frac{25+16}{365}\right)\times\frac{12}{1}$$

$S = 319\,860,34$

$Option(3)$

Question 9

$S = Rs\overline{n}|i$

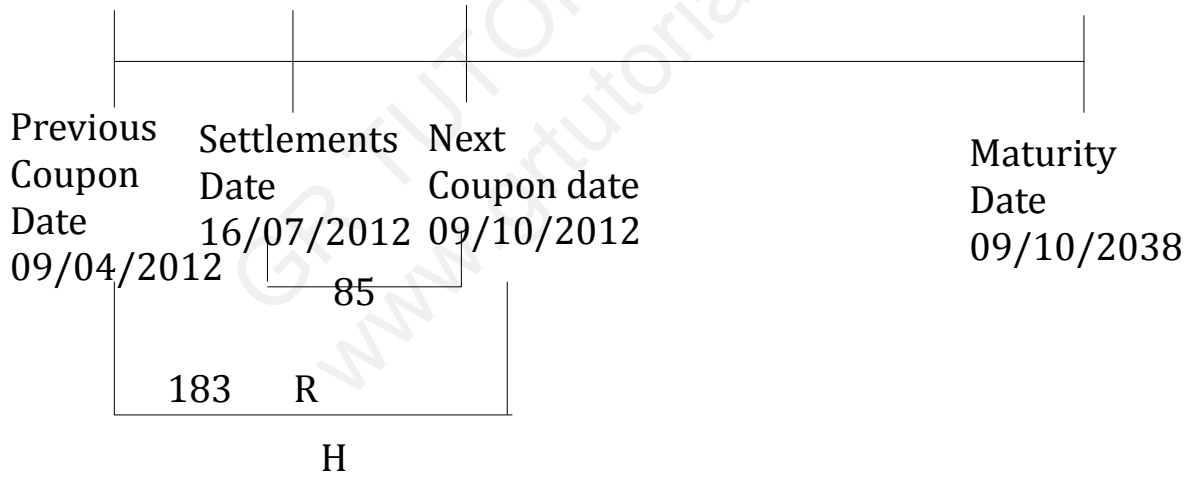
$= 2\,200\overline{5|16}|0,154 \div 12$

$= 39\,297,56$

$\therefore \times = 45\,200 - 2\,200\overline{5|16}|0,154 \div 12$

$Option(2)$

Question 10



$Years = 09/10/2012 - 09/10/2038$

$= 26$

Multiply by 2 *to get the number of half*

yearly coupons – thus $52\left(26 \times 2\right)$

The number of days from the settlement date until next coupon

$\left(\text{int}\,erest\ rate\ is\ R\right)$

Thus $R = 85$

Number of days in half year which the settlement date falls

$\left(09/04/2012 - 09/10/2012\right)$ *is* H

Thus $H = 183$

The present value of the band on $09/10/2012$ *is* :

$$P = da\overline{n}|z + 100\left(1+3\right)^{-n}$$

$$\frac{9,4}{2}a\overline{52}|0,106 \div 2 + 100\left(1+\frac{0,106}{2}\right)^{-52}$$

$$= 82,63215 + 6,8190629$$

$$= 89,45121 + 4,7$$

$$= 94,15121\%$$

We now discount this present value of the bond back to the settlement

bond back to the settlement date to obtain the all in price

$$All\ in\ price = 94,15121\left(1+\frac{0,106}{2}\right)^{-\left(\frac{85}{183}\right)}$$

$$= 91,91965$$

$Option\left(4\right)$

Question 11

$$Accrued\ \text{int}\,erest = \frac{H-R}{365} \times C$$

$$= \frac{183-85}{365} \times 9,4$$

$$= 2,52384$$

$Option\left(3\right)$

Question 12

$$\begin{aligned} Clean\ price &= All\ in\ price - accrued\ \text{interest} \\ &= 91,91965 - 2,52384 \\ &= 89,39581\% \end{aligned}$$

$Option(4)$

Question 13

$$MIRR = \left(\frac{C}{PVout}\right)^{\frac{1}{n}} - 1$$

$$\begin{aligned} with\ M &= 32,7\% \\ P &= 20514 \\ N &= 10 \end{aligned}$$

$$\therefore 0,327 = \left(\frac{C}{20514}\right)^{\frac{1}{10}} - 1$$

$$\begin{aligned} C &= (1,327)^{10} \times 20514 \\ &= 347344 \end{aligned}$$

$Option(2)$

Question 14

$$ARR = \frac{(45000 + 50000 + 60000 + 55000 + 60000) \div 5}{200000}$$

$$\begin{aligned} &= \frac{52000}{200000} \times 100 \\ &= 26\% \end{aligned}$$

$Option(4)$

Question 15

$Variance$
$Page 192 - Study\ guide$
$Option(5)$

Question 16

$PMT = 18\,556,84$
$P/Y = 12$
$C/Y = 12$
$I/Y = 12,05$
$n = 20$
$PV = 1\,679\,999,97\,(to\ the\ nearest\ rand)$
$= 1\,680\,000 = 84\%$
$100 = more$
$whole\ amount = R\,2\,000\,000$
$Option(5)$

Question 17

$Down\ PMT = 2\,000\,000 - 1\,680\,000$
$= R320\,000$
$Option(4)$

Question 18

$Home\,loan \quad 950\,000$

$R = 10\,833,54$

$Fixed\ \text{int}erest = 13,5\%$

$Inflation = 6,8\%$

$Tv = Ran|r$

$10\,833,54\,\overline{|20 \times 12|}\,0,068 \div 12$

$1\,419\,230 - 950\,000$

$= 469\,200$

$Option(1)$

Question 19

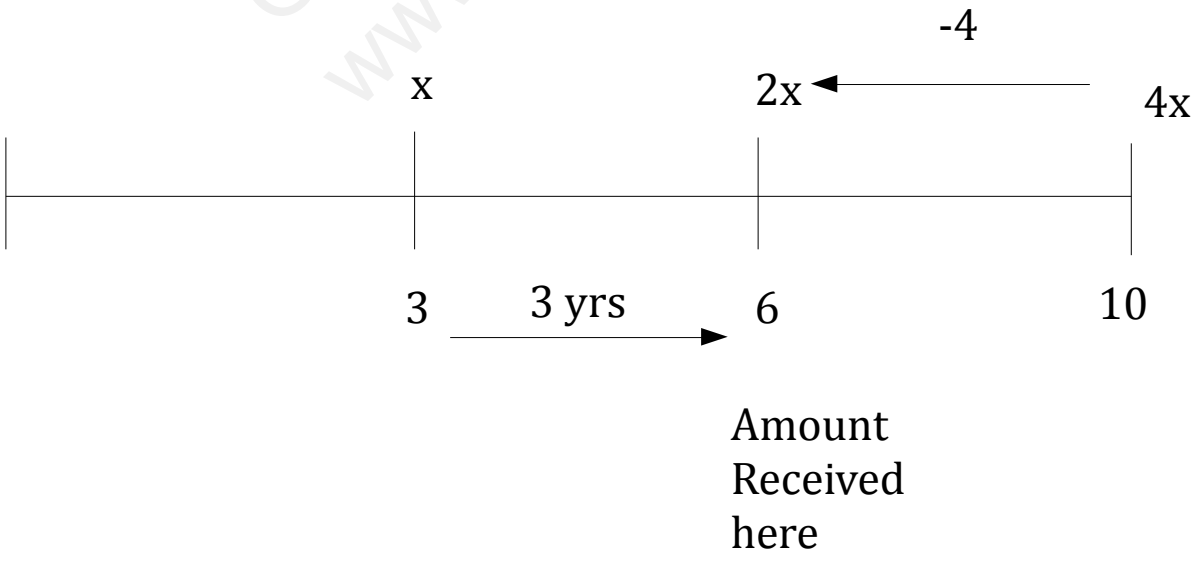
$$\frac{19\,000}{0,095\%}$$

$$= \frac{19\,000}{0,0158333}$$

$$= 1\,200\,000$$

$Option(2)$

Question 20



$$PMT = Obligation$$

$$1200000\left(1+\frac{0,086}{4}\right)^{4\times 6} = \times\left(1+\frac{0,086}{4}\right)^{-4\times 4}$$

$$1999411,332 = 1,29080\times +2\times +2,846073$$

$$1999411,332 = 6,136873\times$$

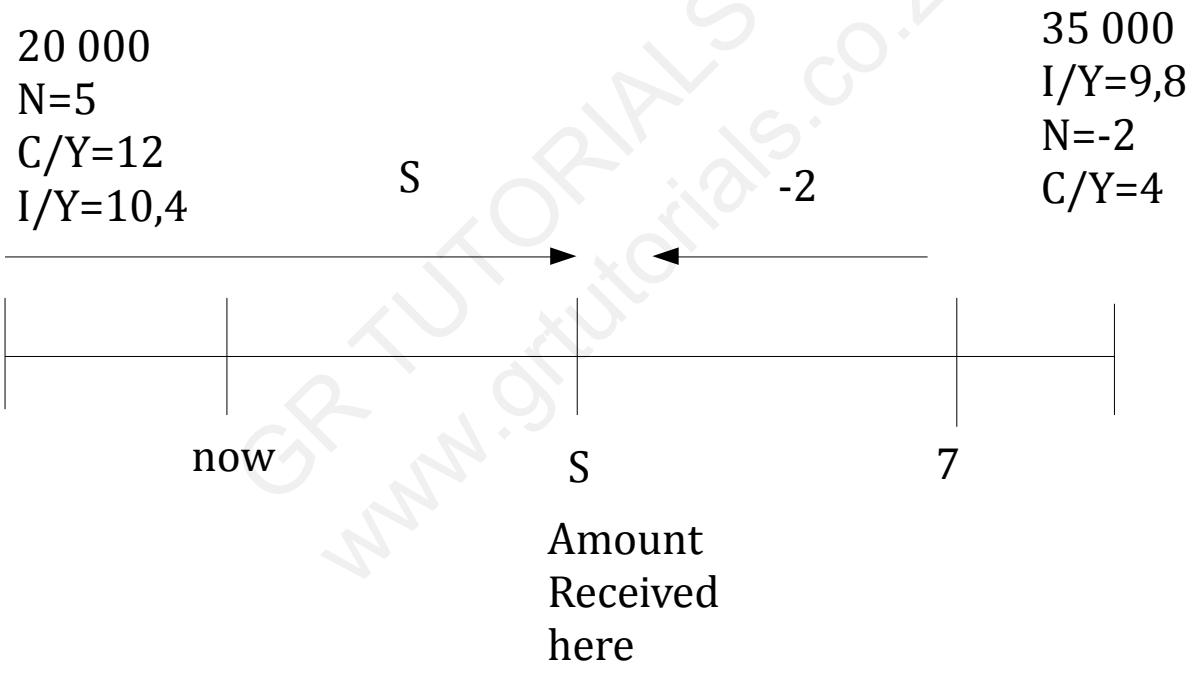
$$\times = \frac{1999411,332}{325803}$$

$$6\,yrs\ from\ now\ is\ 2x = 325803\times 2$$

$$= 651606$$

$$Option(3)$$

Question 21



$$20000\left(1+\frac{0,104}{12}\right)^{5\times 12} + 35000\left(1+\frac{0,098}{4}\right)^{-2\times 4}$$

$$33565,27 + 28838,48$$

$$= R62403,75$$

$$Option(5)$$

Question 22

$$P1 = Ran\overline{|}i$$
$$i = 0{,}122 \div 3$$
$$n = 4 \times 3$$
$$R = 35\,000a\overline{4 \times 3|}0{,}122 \div 3$$
$$= 327\,210{,}63$$
$$Option(5)$$

Question 23

$$S = P\left(1 + \frac{dm}{m}\right)^{tm}$$
$$dm = 0{,}122$$
$$m = 3$$
$$S = 327\,\mathbf{2}10{,}63$$
$$t = 5$$
$$Po = 327\,210{,}63\left(1 + \frac{0{,}122}{3}\right)^{-5\times3}$$
$$= 179\,950{,}37$$
$$Option(1)$$

Question 24

$$S = Pe^{ct}$$
$$P = Se^{-ct}$$
$$= 45\,946e^{-\left(0{,}08\times\frac{57}{12}\right)}$$
$$P = 45\,964^{-(0{,}08\times4{,}75)}$$
$$= 31\,420{,}70$$

Question 25

$$Weighted\ average =$$
$$\frac{\begin{array}{c}10\,000\times 8,5\%+12\,000\times 8,75\%+15\,000\times 9\%+20\,000\times 11\%+\\ 25\,000\times 11,50\%+30\,000\times 11,75\%+100\,000\times 12\%\end{array}}{10\,000+12\,000+15\,000+20\,000+25\,000+30\,000+100\,000}$$
$$=\frac{23\,850}{212\,000}\times 100$$
$$=11,25\%$$
$$Option(4)$$

Questions 26

$$calculator = y=-0,019x+12,33$$
$$Option(2)$$

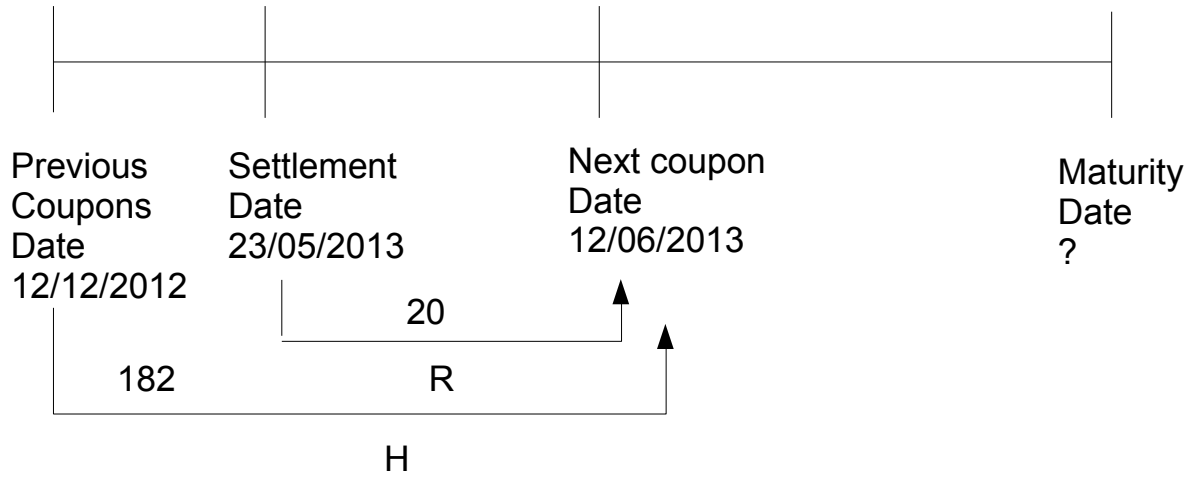
Question 27

$$S = Rs\overline{n}|i$$
$$= 7\,665,255\,\overline{6\times 12}|0,119\div 12$$
$$= 800\,000$$
$$Option(5)$$

Question 28

$$Total\ yearly\cos t = 4\times Interest+12\times PMT$$
$$= 4\times\left(800\,000\times 0,156\times\frac{3}{12}\right)+12\times 7\,665,25$$
$$= 124\,800+91\,983$$
$$= R216\,783$$
$$Option(3)$$

Question 29



$H = 182\,days$

$R = 20\,days$

$Current\ price = 119,47116 - Coupon\ rate\ 6,2$

$= 113,27116$

$\Pr esent\ value = 113,27116 - 10,41966$

$= 102,8515$

$\therefore \frac{12,4}{2} a\overline{n}|0,108 \div 2 = 102,8515$

$\therefore Calculator\ n = 7884\,days$

$Maturity\ date = 12\ December\ 2034$

$Option(3)$

Question 30

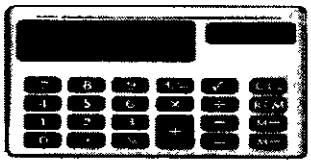
$100\,000(1+0,0799)^{-4} + 900\,000(1+0,0799)^{-9}$

$= 73\,530,21 + 450\,599,43$

$= 524\,130$

$Option(2)$

UNIVERSITY EXAMINATIONS



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UNISA university of south africa

DSC1630 (471017) October/November 2012

DEPARTMENT DECISION SCIENCES
INTRODUCTORY FINANCIAL MATHEMATICS

Duration 2 Hours 100 Marks

EXAMINERS
FIRST MRS MF IMMELMAN
SECOND DR MP MULAUDZI

Programmable pocket calculator is permissible

Closed book examination.

This paper consists of 23 pages including a list of formulæ, a table with the number of each day of the year and 10 sheets of paper for rough work, plus instructions for completing a mark-reading sheet

Please complete the attendance register on the back page, tear it off and hand it to the invigilator.

Answer *all* questions on the mark-reading sheet supplied Carefully follow the instructions for completing the mark-reading sheet Also pay attention to the following.

- Only one option (indicated as [1] [2] [3] [4] [5]) per question is correct Do not mark more than one option per question on the mark-reading sheet
- Marks will *not* be deducted for incorrect answers
- There are 30 questions for a total of 100 marks

You are strongly advised to write your name on the mark-reading sheet. Then, if you have entered your student number incorrectly, we will still be able to link you to the mark-reading sheet.

Question 1

Alet needs R10 500 in ten months' time to buy herself a new lens for her camera Two months ago she deposited R9 000 in a savings account at a simple interest rate of 11,5% per year How much money will Alet still need to buy the lens ten months from now?

[1] R229,50
[2] R408,67
[3] R465,00
[4] R637,50
[5] None of the above

Question 2

Chappie borrowed money on 31 August and agreed to pay back the loan on 2 November of the same year If the discount rate is 18% per year and he received R5 000 on 31 August, what is the value of the loan that Chappie has to pay the bank on 2 November?

[1] R5 000,00
[2] R5 160,32
[3] R4 844,66
[4] R5 155,34
[5] None of the above

Question 3

If money is worth 12% per annum compounded monthly, the principal P will double The time under consideration is therefore .

[1] 5,81 years.
[2] 6,12 years
[3] 7,27 years
[4] 8,33 years
[5] 69,66 years

Questions 4 and 5 relate to the following situation:
Bongi wants to open a delicatessen in the Good Food Mall. On 7 March he invested R375 000 into an account earning 10,45% interest per year, compounded monthly. Interest is credited on the first of every month Bongi will move into his new shop on 28 November of the same year

Question 4

If simple interest is used for odd period calculations and compound interest for full periods, then the amount of money that Bongi will have available in the account on 28 November of the same year will equal .

[1] R403 558,56
[2] R404 300,59.
[3] R404 348,61
[4] R404 419,59
[5] R404 540,76

Question 5

If fractional compounding is used for the full term, the amount of money that Bongi will have available in the account on 28 November will equal

[1] R403 558,56
[2] R404 300,59
[3] R404 348,61
[4] R404 415,85
[5] R404 540,76

Question 6

Jacob invests an amount of money in an account earning 13,88% interest per year, compounded weekly After five years, this amount has accumulated to R50 000 The amount that was invested initially equals

[1] R15 300,00
[2] R25 001,79
[3] R26 105,54
[4] R29 515,94
[5] R34 700,00

Question 7

After investing an amount of money in an account earning interest at a continuous compounding rate of 10,15% per year, you receive R32 412,87 The amount of money that you invested 57 weeks earlier equals approximately

[1] R29 000,00.
[2] R29 153,86
[3] R29 167,68.
[4] R32 768,16.
[5] R36 227,38

Question 8

An interest rate of 14,9% per year, compounded quarterly, is equivalent to a weekly compounded interest rate of .

[1] 14,65%.
[2] 14,88%
[3] 15,16%.
[4] 19,02%.
[5] none of the above

Question 9

If the nominal interest rate per year is 16,5% per annum compounded at the end of every second month, then the effective interest rate equals

[1] 14,527%
[2] 16,181%
[3] 16,677%.
[4] 17,677%.
[5] 18,000%

Question 10

Freedman inherits R2 500 000 He decides to have it paid out to him in two payments one payment four years from now and the other payment, three times the first payment, ten years from now The amount that he can expect to receive ten years from now, if an interest rate of 12,25% per year compounded quarterly is applicable, approximately equals

[1] R1 650 400
[2] R1 875 000.
[3] R2 088 850
[4] R4 951 240
[5] R6 266 545

Question 11

Six years ago Jakes borrowed R150 000 from Martha on condition that he would pay her back nine years from now at an interest rate of 15,5% per year compounded monthly He also owes Martha R250 000 payable six years from now at an interest rate of 16,4% per year compounded half-yearly. Jakes asked Martha if he could settle both his debts in one payment three years from now. The total amount that Jakes has to pay Martha three years from now equals

[1] R400 000,00
[2] R475 017,72
[3] R488 092,15
[4] R755 667,10
[5] R777 202,69

Question 12

The sports club's fund must pay Tandi R3 500 per month indefinitely as compensation for an injury she sustained at the club The approximate amount of money available in the fund for this purpose now, if an interest rate of 11,2% per year, compounded monthly is applicable, equals .

[1] R229 934.
[2] R330 132
[3] R334 661
[4] R375 000
[5] R390 443

Question 13

Monthly payments of R1 200 are paid into a savings account. The applicable interest rate is 7,75% per year, compounded quarterly. After ten years the accumulated amount of these monthly payments approximately to the nearest hundred rand equals .

[1] R144 000
[2] R215 900
[3] R216 500.
[4] R291 100
[5] none of the above.

Question 14

If $S = Pe^{ct}$, then c equals ..

[1] $\frac{\frac{S}{P} - e}{t}$.
[2] $\frac{S - P}{e^t}$
[3] $\frac{S + P}{e^t}$.
[4] $\frac{\ln(S - P)}{t}$
[5] $\frac{\ln\left(\frac{S}{P}\right)}{t}$.

Question 15

Fawzia takes out an endowment policy that matures in 20 years time The expected interest rate per year is 10% Her first payment is R3 600 per year, after which the yearly payment will increase by R360 each year. The amount that she can expect to receive on the maturity date will be

[1] R213 030
[2] R340 380
[3] R412 380
[4] R484 380
[5] none of the above

Questions 16 and 17 relate to the following situation:
Aziza wants to open a curry shop Her husband Hamad lends her the money However, she will only be able to start paying him back five years from now She will then be able to pay R25 000 every second month for six years Interest is charged at 16,9% per year, compounded every two months

Question 16

The amount that Aziza owes her husband when she starts paying him back equals .

[1] R184 087,12
[2] R229 591,36
[3] R487 279,43
[4] R561 047,91
[5] R900 000,00

Question 17

The amount that Aziza's husband lends her now equals

[1] R81 795,20
[2] R105 167,85
[3] R216 512,27
[4] R243 834,05
[5] R391 144,22

Question 18

Monique wants to upgrade her studio in four years' time and estimates that it will cost her R350 000 She starts to save *immediately* by depositing R5 000 at the beginning of every month in an account earning 12,4% per year, compounded monthly. The amount still needed just before she starts to renovate her studio will equal

[1] R38 117,25
[2] R41 307,07
[3] R49 591,37
[4] R51 538,80
[5] R110 000,00

Question 19

Lewis's debt of R275 000 from Ellerine at an interest rate of 16% per year, compounded quarterly, is payable in five years' time. The debt will be discharged by the sinking fund method The sinking fund will earn interest at a rate of 14% per year, compounded half-yearly The half-yearly deposits in the sinking fund approximately equal .

[1] R9 235
[2] R13 750.
[3] R19 904.
[4] R20 235.
[5] R27 500.

Question 20

The following is an extract from an amortisation schedule for the Busy Fingers Knit Shop The loan will be paid off in 15 years

Month	Outstanding principal at beginning of the month	Interest due	Payment	Principal repaid
15	385 232,41	3 081,86	A	1 119,21

The value of A equals .

[1] R125,00
[2] R344,20.
[3] R1 962,65
[4] R2 140,18
[5] R4 201,07

Question 21

Karen's investment of R1 050 000 in Pump Up The Jam restaurant is expected to yield the following sequence of yearly cash flows over the next six years R350 000, R320 000, R240 000, R500 000, R80 000 and R60 000 The IRR (internal rate of return) of the investment therefore equals

[1] 6,71%
[2] 7,94%
[3] 12,41%.
[4] 14,76%.
[5] 15,24%

Questions 22, 23 and 24 relate to the following situation:
David buys a bachelor flat and makes a down payment of 20% on the price of the flat. For the remaining amount he manages to secure a loan at an interest rate of 9,75% per year, compounded monthly for a period of 20 years His monthly payment is R5 311,69

Question 22

The size of the loan (to the nearest rand) equals .

[1] R295 723
[2] R491 712
[3] R560 000
[4] R1 089 577
[5] none of the above

Question 23

The price of the flat is

[1] R354 868.
[2] R614 640.
[3] R672 000
[4] R700 000
[5] R1 529 767

Question 24

If an average inflation rate of 4,67% per year is expected, then the total real cost of the loan equals

[1] R101 198,33
[2] R267 543,13
[3] R458 801,66
[4] R560 000,00
[5] R827 543,13

Question 25

The Girls' Best Friend Boutique sells diamonds The following table represents the number of diamonds sold (y) and the carat value of the diamonds (x)

x	0,5	1	2	5
y	1 000	800	500	20

Suppose there is a linear relationship between the carat value of the diamond and the number of diamonds sold. The coefficient of correlation between the carat value of the diamond and the number of diamonds sold is ...

[1] $-2{,}0758$.
[2] $-0{,}98185$
[3] 0,98185
[4] 1,20213
[5] 1,6250.

Question 26

The slope of the regression line of the above mentioned relationship is

[1] $-207{,}59$
[2] $-0{,}98185$.
[3] 2,125
[4] 1 021,13.
[5] none of the above

Question 27

Consider stock ABC

Coupon rate	9,75% per year
Yield to maturity	11,25% per year
Settlement date	15 November 2012
Maturity date	7 August 2035

The all-in price equals .

[1] R85,63641%
[2] R87,80282%
[3] R87,86673%
[4] R90,39112%
[5] R92,67782%

Question 28

The equation for the present value of stock CCC on 17 December 2012 is given by

$$107{,}55174 = da_{\overline{29}|0{,}135} + 100(1 + \frac{0{,}135}{2})^{-29}$$

The half-yearly coupon rate d is equal to .

[1] 6,75%
[2] 7,35%
[3] 8,55%
[4] 14,70%
[5] none of the above

Question 29

If the profitability index of the Soft Serve Parlour is 1,0514 and the NPV (net present value) equals R25 700, then the original investment approximately equals

[1] R12 528
[2] R13 172
[3] R24 444
[4] R25 700.
[5] R50 000

Question 30

You must choose between two investments, A and B The profitability index (PI), net present value (NPV) and internal rate of return (IRR) of the two investments are as follows

Criteria	Investment A	Investment B
NPV	−44000	38 000
PI	0,945	1,051
IRR	15,37	21,82

What investment/s should you choose, taking all the above criteria into consideration, if the cost of capital is equal to 19% per year?

[1] A
[2] B
[3] Both A and B
[4] Neither A nor B
[5] Too little information to make a decision

The number of each day of the year

FOR LEAP YEARS, ADD ONE TO THE NUMBER OF EVERY DAY AFTER FEBRUARY 28

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	**1**
2	2	33	61	92	122	153	183	214	245	275	306	336	**2**
3	3	34	62	93	123	154	184	215	246	276	307	337	**3**
4	4	35	63	94	124	155	185	216	247	277	308	338	**4**
5	5	36	64	95	125	156	186	217	248	278	309	339	**5**
6	6	37	65	96	126	157	187	218	249	279	310	340	**6**
7	7	38	66	97	127	158	188	219	250	280	311	341	**7**
8	8	39	67	98	128	159	189	220	251	281	312	342	**8**
9	9	40	68	99	129	160	190	221	252	282	313	343	**9**
10	10	41	69	100	130	161	191	222	253	283	314	344	**10**
11	11	42	70	101	131	162	192	223	254	284	315	345	**11**
12	12	43	71	102	132	163	193	224	255	285	316	346	**12**
13	13	44	72	103	133	164	194	225	256	286	317	347	**13**
14	14	45	73	104	134	165	195	226	257	287	318	348	**14**
15	15	46	74	105	135	166	196	227	258	288	319	349	**15**
16	16	47	75	106	136	167	197	228	259	289	320	350	**16**
17	17	48	76	107	137	168	198	229	260	290	321	351	**17**
18	18	49	77	108	138	169	199	230	261	291	322	352	**18**
19	19	50	78	109	139	170	200	231	262	292	323	353	**19**
20	20	51	79	110	140	171	201	232	263	293	324	354	**20**
21	21	52	80	111	141	172	202	233	264	294	325	355	**21**
22	22	53	81	112	142	173	203	234	265	295	326	356	**22**
23	23	54	82	113	143	174	204	235	266	296	327	357	**23**
24	24	55	83	114	144	175	205	236	267	297	328	358	**24**
25	25	56	84	115	145	176	206	237	268	298	329	359	**25**
26	26	57	85	116	146	177	207	238	269	299	330	360	**26**
27	27	58	86	117	147	178	208	239	270	300	331	361	**27**
28	28	59	87	118	148	179	209	240	271	301	332	362	**28**
29	29		88	119	149	180	210	241	272	302	333	363	**29**
30	30		89	120	150	181	211	242	273	303	334	364	**30**
31	31		90		151		212	243		304		365	**31**

FORMULÆ

$$I = Prt$$

$$S = P(1+rt)$$

$$P = S(1-dt)$$

$$S = P\left(1+\frac{j_m}{m}\right)^{tm}$$

$$j_{eff} = 100\left(\left(1+\frac{j_m}{m}\right)^{m}-1\right)$$

$$S = Pe^{ct}$$

$$j_\infty = 100(e^c - 1)$$

$$c = m\ln\left(1+\frac{j_m}{m}\right)$$

$$j_m = m\left(e^{\frac{c}{m}}-1\right)$$

$$i = n\left(\left(1+\frac{j_m}{m}\right)^{\frac{m}{n}}-1\right)$$

$$S = R\left(\frac{(1+i)^n-1}{i}\right)$$

$$S = Rs_{\overline{n}|i}$$

$$P = Ra_{\overline{n}|i}$$

$$P = R\left(\frac{(1+i)^n-1}{i(1+i)^n}\right)$$

$$A = nR + Q\left[\frac{n(n-1)}{2}\right]$$

$$r = \frac{d}{1-dt}$$

$$S = (1+i)Rs_{\overline{n}|i}$$

$$P = (1+i)Ra_{\overline{n}|i}$$

$$P = da_{\overline{n}|z} + 100(1+z)^{-n}$$

$$\frac{H-R}{365}\times c$$

$$\frac{-R}{365}\times c$$

$$MIRR = \left(\frac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$$

$$P = \frac{R}{i}$$

$$S = \left[R+\frac{Q}{i}\right]s_{\overline{n}|i} - \frac{nQ}{i}$$

$$T_r = Ra_{\overline{n}|r} - P$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

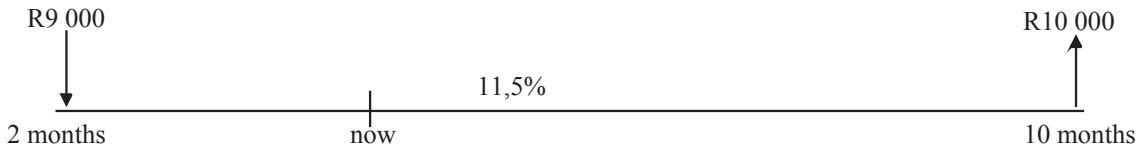
$$\bar{x}_w = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$S = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$$

BASIC SOLUTIONS FOR DSC1630 EXAMINATION QUESTION PAPER OCT/NOV 2012

1. Identification: Simple interest rate



Savings worth at month 10 – move R9 000 from 2 month's ago to 10 month's in future:

$$\begin{aligned} S &= P(1+rt) \\ &= 9\,000\left(1+0{,}115\times\frac{12}{12}\right) \\ &= 9\,000(1{,}115\ldots) \\ &= \text{R}10\,035{,}00. \end{aligned}$$

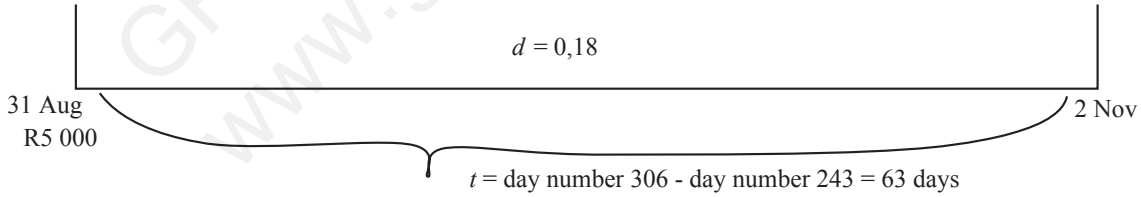
Money Short:

R10 035,00 − R10 500 = −465,00

She shorts R465,00.

Option [3]

2. Identification: Simple discount rate



$$\begin{aligned} P &= S(1-dt) \\ 5\,000 &= S\left(1-0{,}18\times\frac{63}{365}\right) \\ \frac{5\,000}{\left(1-0{,}18\times\frac{63}{365}\right)} &= S \\ S &= \text{R}5\,160{,}32. \end{aligned}$$

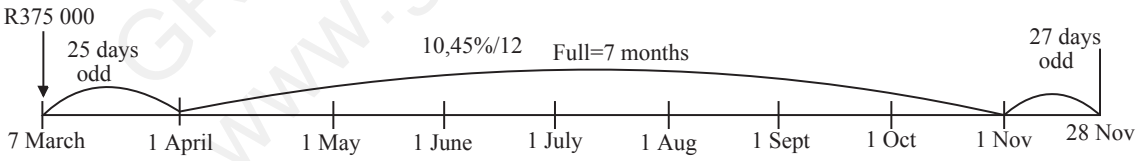
Option [2]

3. Identification: Compound interest

$$
\begin{aligned}
j_m &= 12\% \\
m &= 12 \\
P &= P \\
S &= 2P \\
t &= ? \\
S &= P\left(1+\frac{j_m}{m}\right)^{tm} \\
2P &= P(1+\frac{0{,}12}{12})^{t12} \\
\frac{2P}{P} &= \left(1+\frac{0{,}12}{12}\right)^{12t} \\
\ln 2 &= 12t\ln\left(1+\frac{0{,}12}{12}\right) \\
\frac{\ln 2}{\ln\left(1+\frac{0{,}12}{12}\right)} &= 12t \\
t &= \frac{\left(\frac{\ln 2}{\ln(1+\frac{0{,}12}{12})}\right)}{12} \\
t &= 5{,}80506 \text{ years} \\
t &\approx 5{,}81.
\end{aligned}
$$

Option [1]

4. Identification: Odd periodes – method given



$$
\begin{aligned}
S &= P(1+rt)(1+r)^t(1+rt) \\
&= 375\,000\left(1+0{,}1045\times\frac{25}{365}\right)\left(1+\frac{0{,}1045}{12}\right)^{\frac{7}{12}\times\frac{12}{1}}\left(1+\frac{27}{365}\times 0{,}1045\right) \\
&= 404\,419{,}5870\ldots \\
&\approx \text{R}404\,419{,}59.
\end{aligned}
$$

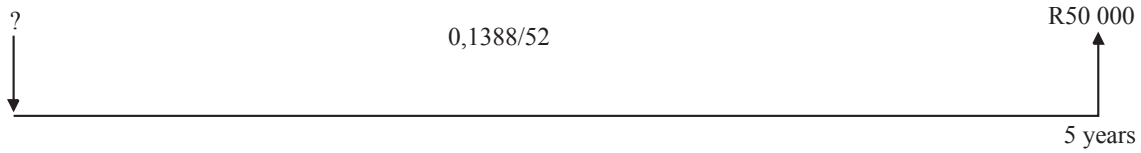
Option [4]

5. Identification: Fractional compounding

$$\begin{aligned} S &= P\left(1+\frac{j_m}{m}\right)^{tm} \\ &= 375\,000\left(1+\frac{0{,}1045}{12}\right)^{\left(\frac{7}{12}+\frac{25}{365}+\frac{27}{365}\right)\times\frac{12}{1}} \\ &= \text{R}404\,415{,}85. \end{aligned}$$

Option [4]

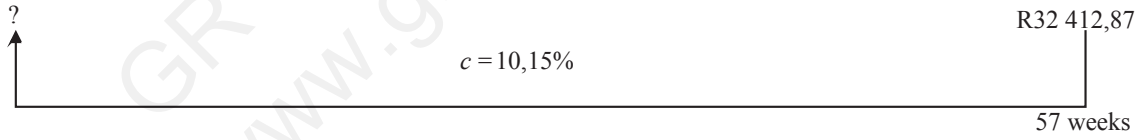
6. Identification: Compound interest



$$\begin{aligned} S &= P(1+j_m/m)^{tm} \\ 50\,000 &= P\left(1+\frac{0{,}1388}{52}\right)^{5\times52} \\ P &= \text{R}25\,001{,}79. \end{aligned}$$

Option [2]

7. Identification: Continuous compounding rate



$$\begin{aligned} S &= Pe^{ct} \\ P &= S/e^{ct} \\ &= \frac{32\,412{,}87}{e^{(0{,}1015\times\frac{57}{52})}} \\ &= \text{R}29\,000{,}00. \end{aligned}$$

Option [1]

8. Identification: Equivalent compound interest rate

$$\begin{aligned} j_n &= n\left(\left(1+\frac{j_m}{m}\right)^{\frac{m}{n}}-1\right) \\ j_{52} &= 52\left(\left(1+\frac{0{,}149}{4}\right)^{\frac{4}{52}}-1\right) \\ &= 0{,}14650 \\ &\approx 14{,}65\%. \end{aligned}$$

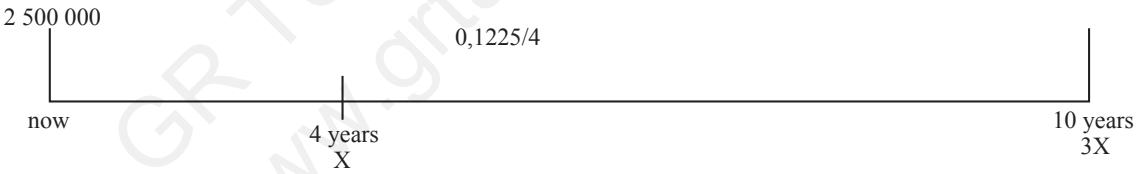
Option [1]

9. Identification: Effective interest rate

$$\begin{aligned} j_{eff} &= 100\left(\left(1+\frac{j_m}{m}\right)^{m}-1\right) \\ &= 100\left(\left(1+\frac{0{,}165}{6}\right)^{6}-1\right) \\ &= 17{,}67684 \\ &\approx 17{,}677\%. \end{aligned}$$

Option [4]

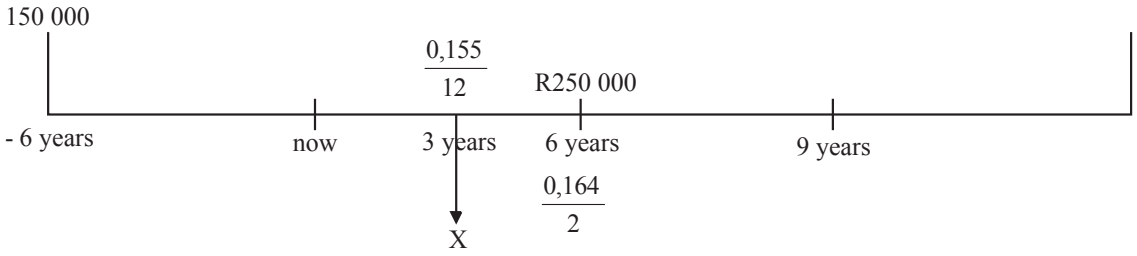
10. Identification: Re-scheduling of debt – equation of value.



$$\begin{aligned} 2\,500\,000\left(1+\frac{0{,}1225}{4}\right)^{10\times4} &= X\left(1+\frac{0{,}1225}{4}\right)^{6\times4}+3X \\ 2\,500\,000\left(1+\frac{0{,}1225}{4}\right)^{10\times4} &= X\left[\left(1+\frac{0{,}1225}{4}\right)^{24}+3\right] \\ 2\,500\,000\left(1+\frac{0{,}1225}{4}\right)^{10\times4} &= 5{,}06261X \\ 2\,500\,000\left(1+\frac{0{,}1225}{4}\right)\Big/5{,}06261 &= X \\ X &= \text{R}1\,650\,412{,}32 \\ 3X &= \text{R}4\,951\,236{,}95. \end{aligned}$$

Option [4]

11. Identification: Re-scheduling of debt – time value of money.



$$\begin{aligned} X &= 150\,000\left(1+\frac{0{,}155}{12}\right)^{9\times 12} + 250\,000\left(1+\frac{0{,}164}{2}\right)^{-(2\times 3)} \\ &= 599\,863{,}8759 + 155\,803{,}23 \\ &= \text{R}755\,667{,}10. \end{aligned}$$

Option [4]

12. Identification: Payments paid indefinitely – Perpetuity

$$\begin{aligned} PMT &= 3\,500 \quad i = 0{,}112/12 \\ P &= R/i \\ &= 3\,500 \Big/ (0{,}112/12) \\ &= \text{R}375\,000. \end{aligned}$$

Option [4]

13. Identification: Equal payments in equal time intervals plus compound interest rate – annuity but time intervals of payments not equal to compounding periods thus change compound interest rate from quarterly to monthly.

$$
\begin{aligned}
j_n &= n\left(\left(1+\frac{j_m}{m}\right)^{\frac{m}{n}}-1\right)\\
&= 12\left(\left(1+\frac{0{,}0775}{4}\right)^{\frac{4}{12}}-1\right)\\
&= 0{,}07700.
\end{aligned}
$$

Thus

$$
\begin{aligned}
S &= Rs_{\overline{n}|i}\\
&= 1\,200 s_{\overline{10\times 12}|\frac{0{,}077}{12}}\\
&= \text{R}215\,899{,}01.
\end{aligned}
$$

Option [2]

14. Identification: Maths manipulation of equation.

$$
\begin{aligned}
S &= Pe^{ct}\\
S \div P &= e^{ct}\\
\ln(S \div P) &= \ln e^{ct}\\
\ln(S \div P) &= ct \ln e\\
\frac{\ln(S \div P)}{t} &= c
\end{aligned}
$$

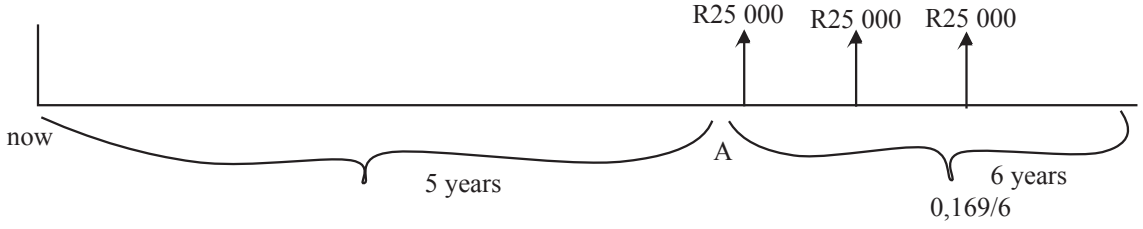
Option [5]

15. Identification: Payments that are made on equal time periods but payments increase each time period with a constant amount – increasing annuity.

$$
\begin{aligned}
S &= \left(R+\frac{Q}{i}\right)s_{\overline{n}|i}-\frac{nQ}{i}\\
&= \left(3\,600+\frac{360}{0{,}10}\right)s_{\overline{20}|0{,}10}-\frac{20(360)}{0{,}1}\\
&= \text{R}340\,379{,}99\\
&\approx \text{R}340\,380.
\end{aligned}
$$

Option [2]

16. Identification: Payment being postponed – deffered annuity.



$$\begin{aligned} A &= Ra_{\overline{n}|i} \\ &= 25\,000a_{\overline{6\times6}|0,169/6} \\ &= \text{R}561\,047{,}91. \end{aligned}$$

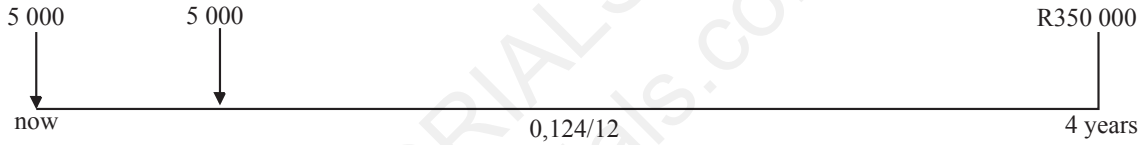
Option [4]

17. Identification: Moving money back in time – time value of money and compound interest.

$$\begin{aligned} P &= S/(1+j_m/m)^{tm} \\ &= \frac{\text{R}561\,047{,}91}{(1+\frac{0{,}169}{6})^{5\times6}} \\ &= \text{R}243\,834{,}05. \end{aligned}$$

Option [4]

18. Identification: Equal amount's deposited in equal time periods + payments made immediately − annuity due.



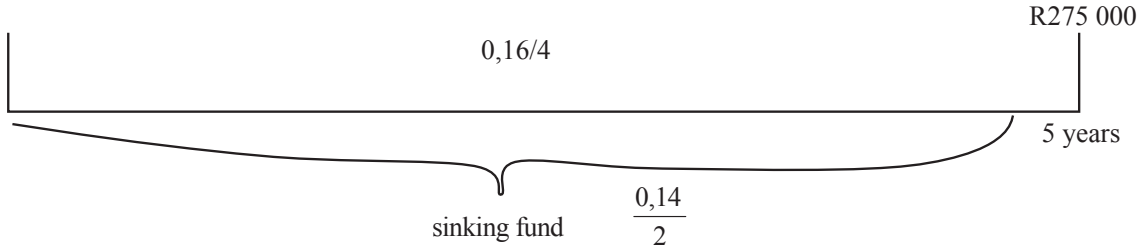
$$\begin{aligned} S &= (1+i)Rs_{\overline{n}|i} \\ &= (1+\frac{0{,}124}{12})5\,000s_{\overline{4\times12}|\frac{0{,}124}{12}} \\ &= \text{R}311\,882{,}75. \end{aligned}$$

Amount needed still:

$$\begin{aligned} &= 350\,000 - 311\,882{,}75 \\ &= \text{R}38\,117{,}25. \end{aligned}$$

Option [1]

19. Identification: Sinking fund.



$$\begin{aligned} S &= Rs_{\overline{n}|i} \\ 275\,000 &= Rs_{\overline{5\times 2}|\frac{0,14}{2}} \\ R &= \text{R}19\,903{,}81 \\ R &\approx \text{R}19\,904. \end{aligned}$$

Option [3]

20. Identification: Amortisation schedule.

$$\begin{aligned} A &= \text{payment} \\ \text{Interest} + \text{principal repaid} &= 3081{,}86 + 1119{,}21 \\ &= \text{R}4\,201{,}07. \end{aligned}$$

Option [5]

21. Identification: Internal rate of return.

    Using your calculator:

$$\begin{aligned} IRR &= 15{,}23893\% \\ &\approx 15{,}24\%. \end{aligned}$$

Option [5]

22. Identification: Equal payments in equal time intervals – annuity or armotisation

$$\begin{aligned} A &= Ra_{\overline{n}|i} \\ &= 5\,311{,}69a_{\overline{20\times 12}|\frac{0,0975}{12}} \\ &= 559\,999{,}54 \\ &\approx \text{R}560\,000. \end{aligned}$$

Option [3]

23. Identification: Percentage calculation.

$$\begin{aligned} 560\,000 &= 80\% \\ ? &= 100\% \\ \frac{560\,000}{1} \times \frac{100}{80} &= \text{R}700\,000. \end{aligned}$$

Option [4]

24. Identification: Total real cost

$$\begin{aligned}\text{Total real cost} &= PV \text{ of annuity using inflation rate} - PV \text{ of annuity}\\ PV &= 5\,311{,}69a_{\overline{20\times12}|\frac{0{,}0467}{12}}\\ &= 827\,543{,}12.\end{aligned}$$

$$\begin{aligned}\text{Real cost} &= 827\,543{,}12 - 560\,000\\ &= \text{R}267\,543{,}13.\end{aligned}$$

Option [2]

25. Identification: Correlation coefficient.
Using your calculator:

$$r = -0{,}98185.$$

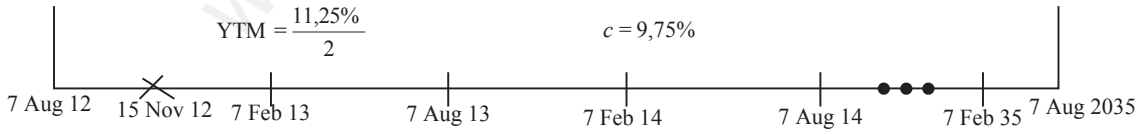
Option [2]

26. Identification: Slope of regression line.
Using your calculator:

$$\begin{aligned}\text{intercept } a &= 1\,021{,}13\\ \text{slope } = b &= -207{,}59\end{aligned}$$

Option [1]

27. Identification: Bond



$$\begin{aligned}n &= 22{,}5 \text{ years}\\ &= 22 \times 2 + 1\\ &= 44 + 1 = 45\end{aligned}$$

$$\begin{aligned} P &= da_{\overline{n}|z} + 100(1+z)^{-n} \\ &= \frac{9{,}75}{2} a_{\overline{45}|0{,}1125/2} + 100\left(1 + \frac{0{,}1125}{2}\right)^{-45} \\ &= 87{,}80282 \end{aligned}$$

Add coupon as number of days > 10 days between settlement date and next coupon date.

$$\begin{aligned} &87{,}80282 + 4{,}8785 \\ &= 92{,}67782\%. \end{aligned}$$

Option [5]

28. Identification: Bond

$$\begin{aligned} 107{,}55174 &= da_{\overline{29}|0{,}135} + 100\left(1 + \frac{0{,}135}{2}\right)^{-2} \\ 107{,}55174 - 100\left(1 + \frac{0{,}135}{2}\right)^{-29} &= da_{\overline{29}|0{,}135} \\ 92{,}50885 &= da_{\overline{29}|0{,}135} \end{aligned}$$

This looks like an annuity formule. Thus use your calculator's financial mode with $92{,}50885 = PV$; $N = 29$; $P/Y = 2$; $I/Y = 13{,}5$ and solve for your payment which is d. $c/2 = d = 7{,}35\%$.

Option [2]

29. Identification: Profitability index

Typing error in answers – Question ignored in October/November 2012 exams.

$$\begin{aligned} PI &= \frac{NPV + \text{initial}}{\text{initial}} \\ 1{,}0514 &= \frac{25\,700 + x}{x} \\ 1{,}0514x &= 25\,700 + x \\ 0{,}0514x &= 25\,700 \\ x &= 500\,000. \end{aligned}$$

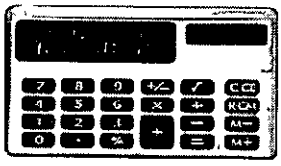
30. Identification: NPV; PI and IRR

Investment A	**Investment B**
$NPV < 0$ reject	$NPV > 0$ accept
$PI < 1$ reject	$PI > 1$ accept
$IRR < K$ reject	$IRR > K$ accept

Accept Invest B

Option [2]

UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (491499) May/June 2013

DEPARTMENT OF DECISION SCIENCES
INTRODUCTORY FINANCIAL MATHEMATICS

Duration 2 Hours 100 Marks

EXAMINERS
FIRST MRS MF IMMELMAN
SECOND DR MP MULAUDZI

Programmable pocket calculator is permissible

Closed book examination

This examination question paper remains the property of the University of South Africa and may not be removed from the examination venue

This paper consists of 23 pages including a list of formulæ, a table with the number of each day of the year and 10 sheets of paper for rough work plus instructions for completing a mark-reading sheet

Please complete the attendance register on the back page, tear it off and hand it to the invigilator.

Answer *all* questions on the mark-reading sheet supplied Follow the instructions for completing the mark-reading sheet carefully Also pay attention to the following

- Only one option (indicated as [1] [2] [3] [4] [5]) per question is correct Do not mark more than one option per question on the mark-reading sheet
- Marks will *not* be deducted for incorrect answers
- There are 30 questions for a total of 100 marks

You are strongly advised to write your name on the mark-reading sheet Then, if you have entered your student number incorrectly, we will still be able to link you to the mark-reading sheet

[TURN OVER]

Question 1

Hasin estimates that he will need R10 500 ten months from *now* to replace the tyres on his truck Two months ago, he invested R9 000 for this purpose at 11,5% simple interest The amount that Hasin will still be short in ten months' time equals

[1] R292,50
[2] R408,67
[3] R465,00
[4] R637,50
[5] none of the above

Question 2

The number of years that it will take R6 000 to accumulate to R9 000 at an annual interest rate of 8% compounded every three months is

[1] 5,08 years
[2] 5,12 years
[3] 5,27 years
[4] 6,25 years
[5] none of the above

Question 3

A loan of R30 000 is due eight months from *now* The applicable simple discount rate is 16,5% per year The present value of the loan equals

[1] R26 700,00
[2] R27 027,03
[3] R33 300.00
[4] R33 463,26
[5] R33 707,87

Question 4

The accumulated amount that Mabe will receive after 38 months if she deposits R13 300 into an account where money is worth 11,35% per year compounded every two months equals

[1] R14 117,08
[2] R15 690,19
[3] R18 080,24
[4] R18 865,83
[5] R18 988,31

Question 5

Sakkie borrowed an amount of money from Lulu The loan will be paid back by means of payments of R25 000 each every second month for six years An interest rate of 7,5% per year compounded every second month will be applicable The present value of the loan equals

[1] R238 067,35
[2] R400 738,72
[3] R721 181,68
[4] R900 000,00
[5] R1 127 887 64

Question 6

Margaret, owner of the Beautiful Me Spa, will discharge a debt that will be worth R870 000 eight years from now using the sinking fund method The debt's interest rate is 13,4% per year, compounded quarterly The sinking fund will earn interest at a rate of 9,2% per year, compounded monthly Her monthly deposit in the sinking fund equals

[1] R5 102,65
[2] R6 166,12
[3] R9 062,50
[4] R15 582,62
[5] R18 538,10

Questions 7 and 8 relate to the following situation:
Pieter borrowed money from his friend Gerhard to buy a share in a game farm. He realises that he will not be able to repay anything for the first five years. Thereafter he is prepared to pay back R40 000 every six months for seven years. Money is worth 9,56% per year, compounded half yearly.

Question 7

The amount of money that Pieter owes Gerhard after five years, when he starts paying him back, equals

[1] R305 216,00
[2] R312 196,08
[3] R352 959,83
[4] R401 574,30
[5] R560 000,00

Question 8

The amount of money that Gerhard lends Pieter to buy a share in the game farm equals

[1] R162 379,02
[2] R191 347,80
[3] R221 279,58
[4] R251 757,24
[5] none of the above

Question 9

After a golf ball struck Charl on the head he was awarded an amount from the Three Iron Fund as compensation for his injuries. He chose to receive R18 900 per month indefinitely. If money is worth 9,95% per year, compounded monthly, then the amount awarded equals approximately

[1] R189 950
[2] R2 279 397
[3] R6 565 554
[4] R7 252 333
[5] none of the above

Questions 10 and 11 relate to the following situation:
Pedal-a-lot sells bicycles The following table represents the selling price of a bicycle (y) in rand and the number of bicycles sold at that price (x)

x	5	15	19	7
y	500	900	1 500	2 000

Question 10

The standard deviation for the number of bicycles sold is

[1] 4
[2] 5,72
[3] 6,6
[4] 11,5
[5] none of the above

Question 11

The correlation coefficient of a linear regression between x and y is approximately

[1] $r = -0{,}16428$
[2] $r = 0{,}16428$
[3] $r = 4$
[4] $r = 5{,}72276$
[5] none of the above

Question 12

The accumulated amount (rounded to the nearest thousand rand) of semi-annual payments of R5 500 for ten years into an account earning 8,9% interest per year compounded monthly, equals

[1] R72 000,00
[2] R83 000,00
[3] R110 000,00
[4] R173 000,00
[5] none of the above

Questions 13 and 14 relate to the following situation:
The following table represents the cash inflows for the Twinkle Toes Boutique for nine years

Year	***Cash inflow*** *(R)*
3	*45 000*
6	*90 000*
9	*115 000*

The applicable interest rate is 11,59% per year The present value of the cash outflows is R95 000

Question 13

The future value of the cash inflows approximately equals

[1] R169 330
[2] R218 000
[3] R250 000
[4] R271 470
[5] R326 950

Question 14

The MIRR (modified internal rate of return) equals

[1] 14,72%
[2] 21,25%
[3] 31,90%
[4] 38,06%
[5] 41,91%

Question 15

The present value of payments of R5 000 paid in the beginning of every quarter into an account for ten years, earning interest at an interest rate of 9,5% per year, compounded quarterly, equals

[1] R128 197,89
[2] R200 000,00
[3] R327 821,53
[4] R131 242,59
[5] none of the above

Questions 16 and 17 relate to the following situation:
The following is an extract from an amortisation schedule for the King Cake Shop The loan will be paid off in 15 years

Month	*Outstanding principal at beginning of month*	*Interest due at end of month*	*Payment*	*Principal repaid*	*Outstanding principal at month end*
15	*R385 232,41*	*R3 081,86*	*A*	*R1 119,21*	*a*
120	*R202 152,34*	*R1 617,22*	*A*	*B*	*R199 568,48*

Question 16

The value of A equals

[1] R125,00
[2] R4 201,07
[3] R1 962,65
[4] R2 140,18
[5] none of the above

Question 17

The value of B equals

[1] R124,99
[2] R1 684,60
[3] R2 583,85
[4] R3 369,21
[5] R5 818,29

Question 18

Brian invests in a retirement savings account He increases his initial annual payment of R7 500 with R1 200 per year If the applicable interest rate is 12,0% per year, the amount of money that he can expect to receive 20 years later equals

[1] R540 393,32
[2] R587 520,00
[3] R626 856,25
[4] R1 060 917,74
[5] R1 260 917,74

Question 19

Agnes deposited R100 000 in an account earning interest of 9,71% per year, compounded quarterly After four years she decided to deposit an additional R12 000 into this account every three months If the interest rate stays at 9,71% per year, compounded quarterly, the total balance in this account after seven years equals

[1] R264 869,85
[2] R311 649,27
[3] R360 602,85
[4] R451 854,23
[5] R477 588,50

Questions 20 and 21 relate to the following situation:
Sweetness wants to buy a new car on a promotion on 15 July 2013 On 4 March 2013 she deposited R450 000 into an account earning 7,65% interest per year, compounded monthly Interest is credited on the first day of each month

Question 20

If simple interest is used for odd periods and compound interest for the rest of the term, then the amount that Sweetness will have available to buy her car on 15 July 2013 equals

[1] R462 803,30
[2] R465 559,33
[3] R465 656,36
[4] R462 513,52
[5] none of the above

Question 21

If fractional compounding is used for the full term, then the amount that Sweetness will have available on 15 July 2013 equals

[1] R462 800,28
[2] R465 458,88
[3] R451 268,38
[4] R451 045,18
[5] none of the above

Question 22

Conrad managed to secure a home loan for 20 years at 11,9% per year, compounded monthly. His monthly payment is R17 505,96. An average inflation rate of 4,75% per year compounded monthly is expected. The real cost of the loan equals

[1] R1 108 963

[2] R1 600 000

[3] R2 708 963

[4] R2 601 430

[5] none of the above

Questions 23 and 24 relate to the following situation:
Four years ago you borrowed R120 000 from Tanya at 12,65% per year, compounded quarterly, and due two years from now. Six months ago you also borrowed R65 000 from Tanya at 15,2% per year compounded monthly and due two years from now.

Question 23

The amount that you must pay Tanya two years from now equals

[1] R185 000,00

[2] R285 408,03

[3] R341 265 67

[4] R348 163 14

[5] R385 752 04

Question 24

After seeing what you owe Tanya two years from now, you decide to reschedule the debt. You will pay Tanya R85 000 *now* and the rest five years from now. Tanya agrees on the condition that the new agreement will run from *now* and will be subject to 13,7% interest per year, compounded half yearly. The amount that you will pay Tanya five years from now equals

[1] R164 878 56

[2] R193 974,78

[3] R353 240,95

[4] R354 164 34

[5] R519 042,89

Question 25

The nominal interest rate per year, j_m, where m is the number of compounding periods, in terms of the effective rate, j_{eff}, is given by

[1] $j_m = m\left[(j_{eff}+1)^{\frac{1}{m}} - 1\right]$

[2] $j_m = \frac{(j_{eff}+1)^{\frac{1}{m}}-1}{m}$

[3] $j_m = \frac{(j_{eff}+1)^{m}-1}{m}$

[4] $j_m = m\left[(j_{eff}+1)^{m} - 1\right]$

[5] none of the above

Question 26

The accumulated sum of R12 000 invested at a continuous compound rate of 16,5% per annum for a period of five years equals

[1] R14 748,73

[2] R23 217,51

[3] R27 382,57

[4] R36 049,99

[5] none of the above

Question 27

Consider Stock AAA

Coupon rate (half yearly)	10,5% per year
Yield to maturity	7,955% per year
Maturity date	8 October 2047
Settlement date	29 May 2013

The all-in price equals

[1] R123,49852%

[2] R126,13814%

[3] R129,73733%

[4] R131,24248%

[5] R134,98733%

Question 28

The net present value (NPV) of the Beautiful People Shop is R14 983 and the profitability index (PI) is 1,034 The initial investment in the shop approximately equals

[1] R7 366

[2] R14 490

[3] R14 983

[4] R15 492

[5] none of the above

Question 29

Trinette decides not to accept the offer from the Flower Fund to receive an amount every three months from her R600 000 investment She asks to receive two payments one four years from now and the second one twice the size of the first one, eight years from now If money is worth 12,6% per year compounded quarterly, then the amount of money that Trinette expects to receive eight years from now equals

[1] R442 658,98

[2] R444 391,83

[3] R885 317,96

[4] R888 783,67

[5] R1 079 134,12

Question 30

The equation for the present value of Bond OPE on 24/6/2013 is given by

$$P(24/6/2013) = 7{,}35a_{\overline{29}|0{,}135-2} + 100\left(1 + \frac{0{,}135}{2}\right)^{-29}$$

and the fraction of the half year to be discounted back is 74/181 The accrued interest equals R4,30932% The clean price for Bond OPE equals

[1] R107,56456%

[2] R109,02688%

[3] R111,87388%

[4] R114,90174%

[5] none of the above

The number of each day of the year

FOR LEAP YEARS, ADD ONE TO THE NUMBER OF EVERY DAY AFTER FEBRUARY 28

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	**1**
2	2	33	61	92	122	153	183	214	245	275	306	336	**2**
3	3	34	62	93	123	154	184	215	246	276	307	337	**3**
4	4	35	63	94	124	155	185	216	247	277	308	338	**4**
5	5	36	64	95	125	156	186	217	248	278	309	339	**5**
6	6	37	65	96	126	157	187	218	249	279	310	340	**6**
7	7	38	66	97	127	158	188	219	250	280	311	341	**7**
8	8	39	67	98	128	159	189	220	251	281	312	342	**8**
9	9	40	68	99	129	160	190	221	252	282	313	343	**9**
10	10	41	69	100	130	161	191	222	253	283	314	344	**10**
11	11	42	70	101	131	162	192	223	254	284	315	345	**11**
12	12	43	71	102	132	163	193	224	255	285	316	346	**12**
13	13	44	72	103	133	164	194	225	256	286	317	347	**13**
14	14	45	73	104	134	165	195	226	257	287	318	348	**14**
15	15	46	74	105	135	166	196	227	258	288	319	349	**15**
16	16	47	75	106	136	167	197	228	259	289	320	350	**16**
17	17	48	76	107	137	168	198	229	260	290	321	351	**17**
18	18	49	77	108	138	169	199	230	261	291	322	352	**18**
19	19	50	78	109	139	170	200	231	262	292	323	353	**19**
20	20	51	79	110	140	171	201	232	263	293	324	354	**20**
21	21	52	80	111	141	172	202	233	264	294	325	355	**21**
22	22	53	81	112	142	173	203	234	265	295	326	356	**22**
23	23	54	82	113	143	174	204	235	266	296	327	357	**23**
24	24	55	83	114	144	175	205	236	267	297	328	358	**24**
25	25	56	84	115	145	176	206	237	268	298	329	359	**25**
26	26	57	85	116	146	177	207	238	269	299	330	360	**26**
27	27	58	86	117	147	178	208	239	270	300	331	361	**27**
28	28	59	87	118	148	179	209	240	271	301	332	362	**28**
29	29		88	119	149	180	210	241	272	302	333	363	**29**
30	30		89	120	150	181	211	242	273	303	334	364	**30**
31	31		90		151		212	243		304		365	**31**

FORMULÆ

$I = Prt$	$r = \dfrac{d}{1-dt}$
$S = P(1+rt)$	$S = (1+i)Rs_{\overline{n}i}$
$P = S(1-dt)$	$P = (1+i)Ra_{\overline{n}i}$
$S = P\left(1+\dfrac{j_m}{m}\right)^{tm}$	$P = da_{\overline{n}z} + 100(1+z)^{-n}$
$J_{eff} = 100\left(\left(1+\dfrac{j_m}{m}\right)^{m}-1\right)$	$\dfrac{H-R}{365}\times c$
$S = Pe^{ct}$	$\dfrac{-R}{365}\times c$
$j_\infty = 100(e^c-1)$	$MIRR = \left(\dfrac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$
$c = m\ln\left(1+\dfrac{j_m}{m}\right)$	$P = \frac{R}{i}$
$j_m = m\left(e^{\frac{c}{m}}-1\right)$	$S = \left[R+\frac{Q}{i}\right]s_{\overline{n}i} - \frac{nQ}{i}$
$i = n\left(\left(1+\dfrac{j_m}{m}\right)^{\frac{m}{n}}-1\right)$	$T_r = Ra_{\overline{n}r} - P$
$S = R\left(\dfrac{(1+i)^n-1}{i}\right)$	$\bar{x} = \dfrac{\sum_{i=1}^{n} x_i}{n}$
$S = Rs_{\overline{n}i}$	$\bar{x}_w = \dfrac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$
$P = Ra_{\overline{n}i}$	$\sum_{i=1}^{n} i = \dfrac{n(n+1)}{2}$
$P = R\left(\dfrac{(1+i)^n-1}{i(1+i)^n}\right)$	$S = \sqrt{\dfrac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$
$A = nR + Q\left[\dfrac{n(n-1)}{2}\right]$	$PI = \dfrac{NPV + \text{original investment}}{\text{original investment}}$

DSC 1630: MAY/JUNE 2013

QUESTION 1

$$simple\ \text{int}erest$$

$$S = P(1+rt)$$
$$= 9000\left(1+0.115\times\frac{12}{12}\right)$$
$$= 10\,035$$
$$\therefore 10\,500 - 10\,035 = 465$$
$$option \quad 3$$

QUESTION 2

$$compound\ \text{int}erest$$
$$FV = PV(1+i)^n$$
$$FV = 9\,000$$
$$1/Y = 8\%$$
$$C/Y = 4$$
$$N = ?$$
$$\therefore N = 5.12\ yrs \quad calculator$$
$$option \quad 2$$

QUESTION 3

$$simple\ discount$$
$$P = S(1-dt)$$
$$= 30\,000\left(1-0.165\times\frac{8}{12}\right)$$
$$= 26\,700$$
$$option \quad 1$$

QUESTION 4

$$\begin{aligned}
&compound\ \text{int}\ erest \\
&S = P(1+i)^n \\
&= 13300\left(1+\frac{0.1135}{6}\right)^{\frac{38}{12}\times 6} \\
&= 18988.31 \\
&option \quad 5
\end{aligned}$$

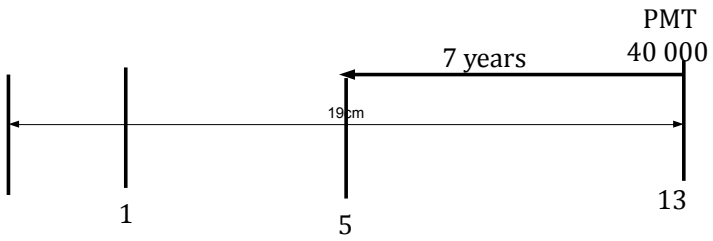
QUESTION 5

$$\begin{aligned}
PMT &= R\,25000 \\
1/Y &= 7.5\% \\
P/Y &= 6 \\
N &= 6 \\
PV &= 721181.68 \\
option &\quad 3
\end{aligned}$$

QUESTION 6

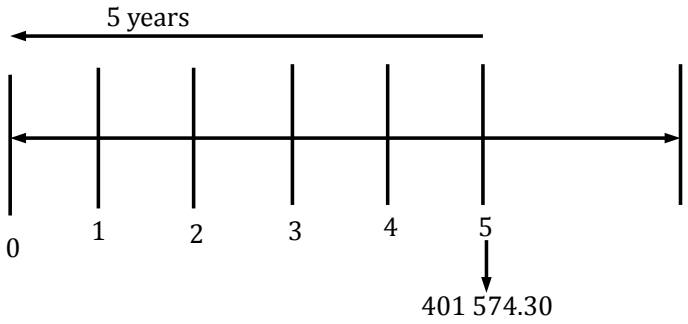
$$\begin{aligned}
&\text{sin}\ king\ funds \\
&S = Rs\,\overline{ni} \\
&870000 = Rs\,\overline{8\times 12}0.092\div 12 \\
&R = \frac{870000}{S\,\overline{8\times 12}\,0.092\times 12} \\
&= 6166.12 \\
&option \quad 2
\end{aligned}$$

QUESTION 7



$$PMT = 40\,000$$
$$C/Y = 2$$
$$P/Y = 2$$
$$1/Y = 9.56$$
$$N = 7\ years$$
$$PV = ?$$
$$\therefore PV = 401574.30$$
$$option \quad 4$$

QUESTION 8



$FV = 401574.30$

$1/Y = 9.56$

$C/Y = 2$

$N = 5$

$PV = ?$

$\therefore PV = 251757.24$

option 4

QUESTION 9

$$\frac{Q}{i}$$

$$= \frac{18900}{\frac{0.0995}{12}} = 2279396$$

option 2

QUESTION 10

calculator 6.6 *standard deviation*

option 3

QUESTION 11

correlation coefficient

5;500 *DATA*

15;900 *DATA*

19;1500 *DATA*

7;2000 *DATA*

RCL r

$r = 0.16428$

option 2

QUESTION 12

$$PMT = 5500$$
$$1/Y = 8.9\%$$
$$C/Y = 12$$
$$P/Y = 10$$
$$N = 10$$
$$FV = ?$$
$$\therefore FV = 173000$$
option 4

QUESTION 13

$$45000(1+0.1159)^{6} = 86.876$$
$$90000(1+0.1159)^{3} = 125059.97$$
$$\begin{array}{ll} TOTAL & +\underline{115000} \\ & \underline{\underline{326950}} \end{array}$$
option 5

QUESTION 14

$$MIRR = \left(\frac{C}{PV_{out}}\right)^{\frac{1}{n}} - 1$$
$$= \left(\frac{326950}{95000}\right)^{\frac{1}{9}} - 1$$
$$= 14.72\%$$
option 1

QUESTION 15

$$calcultor \rightarrow 2nd\ \ F \quad FV = BGN$$

$$PMT = -5000$$
$$P/Y = 4$$
$$1/Y = 9.5$$
$$C/Y = 4$$
$$N = 10\ yrs$$
$$PV = ?$$
$$\therefore PV = 131242.59$$
$$option\ \ 4$$

QUESTION 16

$$payment = Interest\ due + \Pr incipal\ repaid$$
$$= 3081.86 + 1119.21$$
$$= 4201.07$$
$$option\ \ 2$$

QUESTION 17

$$\Pr incipal\ repaid = Payment - Interest\ due$$
$$= 4201.07 - 1617.22$$
$$= 2583.85$$
$$option\ \ 3$$

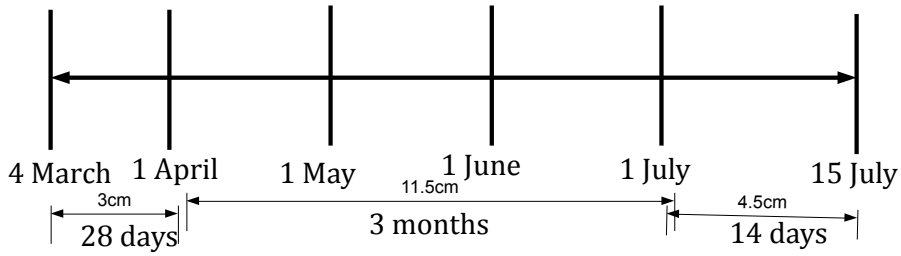
QUESTION 18

$$\text{Increasing annuity}$$
$$S\bar{n}i\left(R+\frac{Q}{i}\right)-\frac{nQ}{i}$$
$$=\left(7\,500+\frac{1200}{0.12}\right)S\bar{n}0.12-\frac{20\times1200}{0.12}$$
$$=160\,917.74-200\,000$$
$$=1060\,917.74$$
$$\text{option } 4$$

QUESTION 19

$$PV=100\,000 \qquad 1/Y=9.71\% \qquad C/Y=4$$
$$N=4 \qquad FV=?$$
$$\therefore FV=146\,779.42$$
$$\therefore 146\,779.42\left(1+\frac{0.971}{4}\right)^{3\times4}=195\,732.99$$
$$PMT=12\,000$$
$$P/Y=4$$
$$C/Y=4$$
$$1/Y=9.71$$
$$N=3$$
$$FV=164\,869.85$$
$$\therefore 360\,602.85$$
$$\text{option } 3$$

QUESTION 20



$$S = P(1+rt)\left(1+\frac{vm}{m}\right)^{tm}(1+rt)$$

$$450\,000\left(1+0.0765\times\frac{28}{365}\right)=452\,640.82$$

$$452\,640.82\left(1+\frac{0.0765}{12}\right)^{\frac{3}{12}\times 12}=461\,352.88$$

$$461\,352.88\left(1+0.0765\times\frac{14}{365}\right)=462\,706.60$$

option 5

QUESTION 21

$$450\,000\left(1+\frac{0.0765}{12}\right)^{\left(\frac{3}{12}+\frac{28+14}{365}\right)\times 12}$$

$$=462\,703.60$$

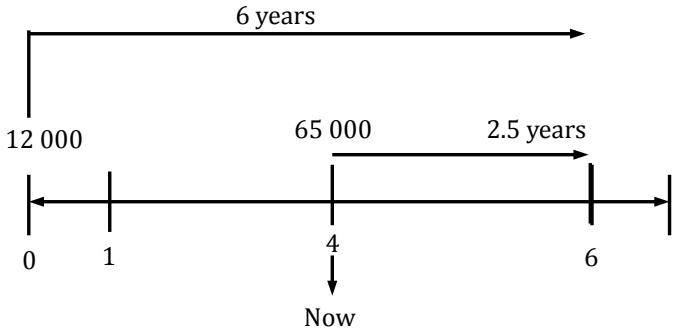
option 5

QUESTION 22

$$P = Ra\overline{n}i$$
$$= 17505.96\, a\overline{20\times 12}\, 0.119 \div 12$$
$$= 1600000$$
$$Tv = Ra\overline{n}i$$
$$= 17505.96\, a\overline{20\times 12}\, 0.0475 \div 12$$
$$= 2708963.16$$
$$\therefore 2708963.16 - 1600000$$
$$= 1108963$$

optuion 1

QUESTION 23



$$120000\left(1+\frac{0.1265}{4}\right)^{6\times 4} = 253341.21$$
$$65000\left(1+\frac{0.152}{12}\right)^{2.5\times 12} = \underline{94821.93}$$
$$\underline{\underline{348163.14}}$$

option 4

QUESTION 24

$$348163.14\left(1+\frac{0.137}{2}\right)^{3\times 2}=518119.51$$

$$85000\left(1+\frac{0.137}{2}\right)^{5\times 2}=164878.56$$

$$\therefore 518119.51-164878.56=353240.95$$

option 3

QUESTION 25

$$Jeff+1=\left(1+\frac{vm}{m}\right)^{m}$$

$$1+\frac{vm}{m}=\left(jeff+1\right)^{\frac{1}{m}}$$

$$\frac{vm}{m}=\left(jeff+1\right)^{\frac{1}{m}}-1$$

$$vm=m\left\{\left(jeff+1\right)^{\frac{1}{m}}-1\right\}$$

option 1

QUESTION 26

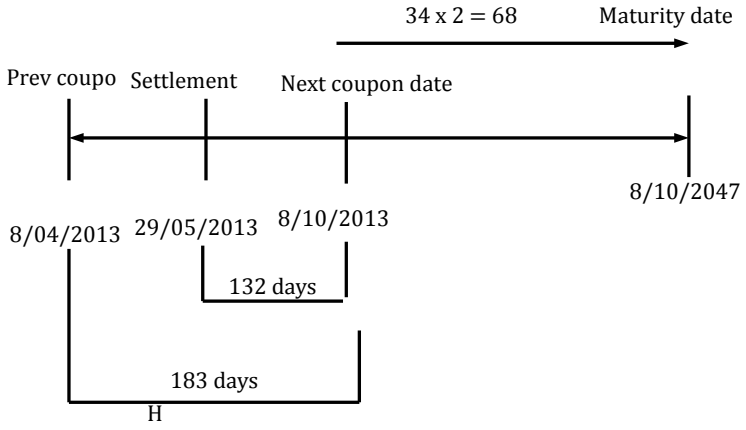
$$S=Pe^{ct}$$

$$=12000e^{(0.165\times 5)}$$

$$=27383.57$$

option 3

QUESTION 27



$$\frac{10.5}{2} a\overline{68}\,0.07955 \div 2 + 100\left(1+\frac{0.07955}{2}\right)^{-68}$$

$$122.688\,44110 + 7.048922876$$

$$= 129.7373339$$

$$\therefore 129.7373339 + 5.25 = 134.9873339$$

$$All\ in\ price = 134.9873339\left(1+\frac{0.7955}{2}\right)^{-\left(\frac{132}{183}\right)}$$

$$= 131.24248\%$$

$option\ 4$

QUESTION 28

$$PI = \frac{NPV + initial\ investment\ (x)}{initial\ investment\ \ (x)}$$

$$1.034 = \frac{14983 + initial\ investment\ \ (x)}{initial\ investment\ \ (x)}$$

$$1.034x = 14983 + x$$

$$1.034x - x = 14983$$

$$0.034x = 14983$$

$$x = \frac{14983}{0.034}$$

$$x = 440676.47$$

$$option\ \ 5$$

QUESTION 29

$$x = 444391.83$$

$$\therefore 2x = 444391.83 \times 2$$

$$= 888783.67$$

$$option\ \ 4$$

QUESTION 30

$$7.35\, a\, \overline{29}\, 0.135 \div 2 + 100\left(1 + \frac{0.135}{2}\right)^{-29}$$

$$95.50885 + 15.04289$$

$$= 107.55174$$

$$This\ is\ a\ cum - \text{int}\ erest\ case\ \ due\ to\ the\ \ fact\ that\ R = 74$$

$$P = (24/06/2013) = 10755174 + 7.35$$

$$= 114.90174$$

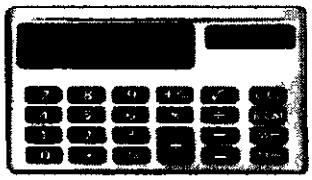
$$P = 114.90174\left(1 + \frac{0.135}{2}\right)^{-\frac{74}{181}} = 111.87288$$

$$clean\ price = 111.87388 - 7.30932$$

$$= 107.56456\%$$

$$option\ 1$$

UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (474632) October/November 2013

DEPARTMENT OF DECISION SCIENCES
INTRODUCTORY FINANCIAL MATHEMATICS

Duration 2 Hours 100 Marks

EXAMINERS :
FIRST MRS MF IMMELMAN
SECOND PROF MP MULAUDZI

Programmable pocket calculator is permissible.

Closed book examination.

This paper consists of 23 pages including a list of formulæ, a table with the number of each day of the year and 10 sheets of paper for rough work plus instructions for completing a mark-reading sheet

Please complete the attendance register on the back page, tear it off and hand it to the invigilator.

Answer *all* questions on the mark-reading sheet supplied Follow the instructions for completing the mark-reading sheet carefully Also pay attention to the following

- Only one option (indicated as [1] [2] [3] [4] [5]) per question is correct Do not mark more than one option per question on the mark-reading sheet
- Marks will *not* be deducted for incorrect answers
- There are 30 questions for a total of 100 marks

You are strongly advised to write your name on the mark-reading sheet Then, if you have entered your student number incorrectly, we will still be able to link you to the mark-reading sheet.

Question 1

Lulu opens a savings account, that earns 8,47% simple interest per year to save for a oriental carpet Lulu is planning to buy the carpet in 20 months' time when she visits her aunt in Turkey. The amount that she must invest now if the cost of the carpet is R18 000 equals

[1] R15 459,00.
[2] R15 718,93.
[3] R15 773,33.
[4] R16 813,26.
[5] R20 541,00

Question 2

You are quoted a simple discount rate of 14,29% for eight months. The equivalent simple interest rate equals

[1] 6,668%
[2] 9,527%
[3] 13,047%
[4] 14,29%
[5] none of the above

Question 3

The accumulated amount that Greg will receive after 38 months if he deposits R13 300 into an account paying 11,35% interest per year compounded every two months equals

[1] R14 117,08
[2] R15 690,19
[3] R18 080,24
[4] R18 865,83
[5] R18 988,31

Question 4

Charlie received R32 412,87 after investing an amount of money in an account earning interest at a continuous compounding rate of 10,15% per year. The amount of money that he invested 57 weeks earlier equals approximately

[1] R29 000,00

[2] R29 153,86.

[3] R29 167,68

[4] R32 768,16

[5] R36 227,38.

Question 5

Four years ago Piet borrowed R35 000 from Ina at 11,3% per year, compounded semi-annually payable three years from *now* He must also pay her R50 000 five years from *now.* The applicable interest rate for this transaction was 10,1% per year, compounded quarterly The amount of money that Piet will owe Ina three years from *now* equals

[1] R85 000,00

[2] R89 630,00

[3] R110 488,22.

[4] R116 508,49

[5] R125 551,15

Question 6

The following figures show the profit of a flower shop for the past five years: R360 000, R550 000, R200 000, R80 000 and R700 000. The standard deviation of the data to the nearest rand equals

[1] R225 424

[2] R252 032

[3] R378 000

[4] R1 890 000.

[5] none of the above

Question 7

An effective rate of 29,61% corresponds to a nominal rate, compounded weekly, of

[1] 26%
[2] 29,53%
[3] 29,61%
[4] 34,35%
[5] none of the above.

Questions 8 and 9 relate to the following situation:
Dawn will discharge a debt of R200 000 six years from now while using the sinking fund method The debt's interest is 15,6% per year, paid quarterly. The sinking fund will earn interest at a rate of 8,4% per year, compounded monthly.

Question 8

The monthly deposits in the sinking fund will equal

[1] R1 694,44
[2] R2 145,84
[3] R2 777,78
[4] R5 183,41
[5] R6 494,38

Question 9

The total yearly cost to discharge the debt (to the nearest rand) will equal

[1] R51 533
[2] R56 950
[3] R109 133
[4] R114 334.
[5] none of the above

Question 10

Ian has inherited R1 250 000 to be paid out as he chooses Assume that money is worth 7,91% per year compounded quarterly If Ian chooses to be paid a fixed amount every three months for an indefinite period of time, the amount he will receive from his inheritance every three months will be

[1] R24 718,75
[2] R32 958,33.
[3] R98 875,00.
[4] R312 500,00
[5] R416 666,67

Questions 11 and 12 relate to the following situation:
On 5 April Sam invested R75 000 in an account paying 8,37% interest per year, compounded monthly Interest is credited on the 1st of every month. Sam wants to open a second-hand cellphone shop in the new Talk-and-Listen complex He will move into his new premises on 21 November of the same year.

Question 11

If simple interest is used for odd period calculations and compound interest for the full term, then the amount of money that Sam will have available in the account on 21 November will equal

[1] R78 195,04
[2] R78 955,68
[3] R79 002,95
[4] R79 018,82
[5] R79 020,96

Question 12

If fractional compounding is used for the full term then Sam will receive

[1] R78 439,73.
[2] R78 896,69.
[3] R79 020,29
[4] R79 027,82
[5] R79 047,39

Question 13

The number of years that it will take R6 000 to accumulate to R9 000 at an annual interest rate of 8% compounded every three months is

[1] 5,08 years
[2] 5,12 years
[3] 5,27 years
[4] 6,25 years
[5] none of the above

Questions 14 and 15 relate to the following situation:
Grace borrowed money from her mother. Grace feels that she will only be able to start repaying her debt after four years. She will then pay her mother R95 000 at the end of every six months for five years Money is worth 18,6% per year, compounded semi-annually

Question 14

The present value of Grace's debt when she will start repaying her mother is equal to

[1] R519 995,65
[2] R586 176,76
[3] R601 708,66.
[4] R687 736,46
[5] R950 000,00

Question 15

The amount of money, to the nearest rand, that Grace's mother originally lent her equals

[1] R237 500.
[2] R247 278
[3] R255 294
[4] R295 410
[5] R347 603

Question 16

Eva wants to go overseas and estimates that she will need R35 000 for her trip. She decides to save for this trip by depositing an amount of R500 once a month into an account earning 11,32% interest per year, compounded monthly The approximate time it will take Eva to have R35 000 available for her trip equals

[1] 40 months
[2] 54 months
[3] 70 months
[4] 115 months
[5] none of the above

Question 17

Moses bought a house and managed to secure a home loan for R790 000 with monthly payments of R9 680,70 at a fixed interest rate of 13,75% per year, compounded monthly, over a period of 20 years If an average yearly inflation rate of 9,2% is expected, then the real cost of the loan (the difference between the total value of the loan and the actual principal borrowed) equals

[1] R87 126.
[2] R201 642
[3] R270 749
[4] R588 358
[5] R1 060 749.

Question 18

Consider	Bond XXX
Coupon rate	9,6% per year
Yield to maturity	10,4% per year
Settlement date.	17 May 2013
Maturity date:	14 December 2036

The all-in price equals

[1] R92,29517%
[2] R92,33574%
[3] R97,05788%
[4] R97,06202%.
[5] R97,09865%.

Question 19

The following is the price equation for Bond AAA

$$96{,}80770 = 7{,}5a_{\overline{15}|i} + 32{,}09888$$

The yearly yield to maturity equals

[1] 7,87%
[2] 15,74%
[3] 16,55%
[4] 19,39%
[5] 21,6%

Question 20

You started saving to pay for your children's university costs in 20 years' time Your first payment was R3 600 per year, after which your yearly payments increased by R360 each year If the expected interest rate per year is 10%, the amount that you expect to receive to the nearest rand on the maturity date will be

[1] R213 030.
[2] R340 380
[3] R412 380
[4] R484 380.
[5] none of the above

Question 21

If $S = Pe^{ct}$ then t equals

[1] $\frac{\frac{S}{P}-e}{c}$.
[2] $\frac{S-P}{e^c}$.
[3] $\frac{S+P}{e^c}$
[4] $\frac{\ln(S-P)}{c}$.
[5] $\frac{\ln\left(\frac{S}{P}\right)}{c}$

Question 22

You are depositing a monthly amount of R1 200 into an account earning 7,75% interest per year, compounded quarterly The value of your savings rounded to the nearest hundred rand after 10 years will equal

[1] R144 000.
[2] R215 900
[3] R216 500
[4] R291 100
[5] none of the above

Question 23

An investment with an initial outlay of R500 000 generates five successive annual cash inflows of R75 000, R190 000, R40 000, R150 000 and R180 000 respectively. The internal rate of return (IRR) equals

[1] 7,78%.
[2] 9,48%.
[3] 21,3%.
[4] 27,0%.
[5] none of the above

Question 24

A nominal interest rate of 19,4% per year, compounded monthly, is equivalent to a continuous compounding rate of

[1] 19,4%.
[2] 19,558%.
[3] 21,22%.
[4] 21,41%.
[5] none of the above

Question 25

The following is an extract from the amortisation schedule of a home loan

Month	Outstanding principal at month beginning	Interest due at month end	Monthly payment	Principal repaid	Outstanding principal at month end
147	R8 155,83	A	R2 080,54	R2 014,27	R6 141,56
148	R6 141,56	R49,90	R2 080,54	R2 030,64	B
149	B	R33,40	R2 080,54	R2 047,14	R2 063,78
150	R2 063,78	R16,77	R2 080,54	R2 063,77	0

The value of A equals

[1] R41,65.
[2] R49,50.
[3] R66,27.
[4] R166,33
[5] R167,86

Question 26

Three students each owe you an amount of R15 000. Nkosi must pay you R15 000 back in three months' time from now, Lerato hers in five months' time from now and Storm his in seven months' time from now It is now the end of May 2013. Due to the bad financial affairs of the students you tell them that they can re-schedule their payments to the end of December 2013. However, you will charge simple interest at 10% per year from the time that they were each supposed to pay back their amounts of R15 000 till the end of December 2013 The amount that you will receive at the end of December 2013 will equal

[1] R45 750,00
[2] R45 757,33
[3] R46 875,00.
[4] R47 625,00
[5] none of the above.

Question 27

The following table supplies data of the inflation rate and the corresponding prime lending rate during the same time period

Inflation rate (%)(x)	*Prime lending rate* (%)(y)
3,3	5,2
6,2	8,0
11,0	10,8
9,1	7,9
5,8	6,8
6,5	6,9
7,6	9,0

The correlation coefficient of the data equals

[1] $-0{,}908$.

[2] $+0{,}495$

[3] $+0{,}546$

[4] $+0{,}908$

[5] none of the above

Question 28

Dieter owes Paul R3 000 due 10 months from *now*, and R25 000 due 32 months from *now*. Dieter asks Paul if he can discharge his obligations by two equal payments one *now* and the other one 28 months from *now*. Paul agrees on condition that a 14,75% interest rate, compounded every two months, is applicable The amount that Dieter will pay Paul 28 months from *now* will equal approximately

[1] R11 455

[2] R11 511

[3] R11 907.

[4] R14 000

[5] R20 000

Question 29

You must choose between two investments, A and B The profitability index (PI), net present value (NPV) and internal rate of return (IRR) of the two investments are as follows

Criteria	Investment A	Investment B
NPV	44 000	−22 000
PI	1,945	0,071
IRR	16,00	8,04

What investment/s should you choose, taking all the above criteria into consideration, if the cost of capital is equal to 12% per year?

[1] A.

[2] B

[3] Both A and B

[4] Neither A nor B

[5] Too little information to make a decision.

Question 30

Charles has just realised that his silver anniversary is 20 months away He wants to buy his lovely devoted wife Diana a diamond ring for the occasion He *immediately* starts to make monthly deposits of R1 500 into an account earning 9,30% interest per year, compounded monthly After 11 deposits, he increases his monthly payments to R2 500. The amount of money that Charles will have available just before his anniversary to buy the diamond ring will equal

[1] R39 000,00

[2] R39 241,54.

[3] R40 497,68

[4] R40 677,56.

[5] R41 921,42.

The number of each day of the year

FOR LEAP YEARS, ADD ONE TO THE NUMBER OF EVERY DAY AFTER FEBRUARY 28.

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	1	32	60	91	121	152	182	213	244	274	305	335	**1**
2	2	33	61	92	122	153	183	214	245	275	306	336	**2**
3	3	34	62	93	123	154	184	215	246	276	307	337	**3**
4	4	35	63	94	124	155	185	216	247	277	308	338	**4**
5	5	36	64	95	125	156	186	217	248	278	309	339	**5**
6	6	37	65	96	126	157	187	218	249	279	310	340	**6**
7	7	38	66	97	127	158	188	219	250	280	311	341	**7**
8	8	39	67	98	128	159	189	220	251	281	312	342	**8**
9	9	40	68	99	129	160	190	221	252	282	313	343	**9**
10	10	41	69	100	130	161	191	222	253	283	314	344	**10**
11	11	42	70	101	131	162	192	223	254	284	315	345	**11**
12	12	43	71	102	132	163	193	224	255	285	316	346	**12**
13	13	44	72	103	133	164	194	225	256	286	317	347	**13**
14	14	45	73	104	134	165	195	226	257	287	318	348	**14**
15	15	46	74	105	135	166	196	227	258	288	319	349	**15**
16	16	47	75	106	136	167	197	228	259	289	320	350	**16**
17	17	48	76	107	137	168	198	229	260	290	321	351	**17**
18	18	49	77	108	138	169	199	230	261	291	322	352	**18**
19	19	50	78	109	139	170	200	231	262	292	323	353	**19**
20	20	51	79	110	140	171	201	232	263	293	324	354	**20**
21	21	52	80	111	141	172	202	233	264	294	325	355	**21**
22	22	53	81	112	142	173	203	234	265	295	326	356	**22**
23	23	54	82	113	143	174	204	235	266	296	327	357	**23**
24	24	55	83	114	144	175	205	236	267	297	328	358	**24**
25	25	56	84	115	145	176	206	237	268	298	329	359	**25**
26	26	57	85	116	146	177	207	238	269	299	330	360	**26**
27	27	58	86	117	147	178	208	239	270	300	331	361	**27**
28	28	59	87	118	148	179	209	240	271	301	332	362	**28**
29	29		88	119	149	180	210	241	272	302	333	363	**29**
30	30		89	120	150	181	211	242	273	303	334	364	**30**
31	31		90		151		212	243		304		365	**31**

FORMULÆ

$I = Prt$	$r = \dfrac{d}{1-dt}$
$S = P(1+rt)$	$S = (1+i)Rs_{\overline{n}i}$
$P = S(1-dt)$	$P = (1+i)Ra_{\overline{n}i}$
$S = P\left(1+\dfrac{j_m}{m}\right)^{tm}$	$P = da_{\overline{n}z} + 100(1+z)^{-n}$
$J_{eff} = 100\left(\left(1+\dfrac{j_m}{m}\right)^{m}-1\right)$	$\dfrac{H-R}{365}\times c$
$S = Pe^{ct}$	$\dfrac{-R}{365}\times c$
$j_\infty = 100(e^c-1)$	$MIRR = \left(\dfrac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$
$c = m\ln\left(1+\dfrac{j_m}{m}\right)$	$P = \frac{R}{i}$
$j_m = m\left(e^{\frac{c}{m}}-1\right)$	$S = \left[R+\frac{Q}{i}\right]s_{\overline{n}i} - \frac{nQ}{i}$
$i = n\left(\left(1+\dfrac{j_m}{m}\right)^{\frac{m}{n}}-1\right)$	$T_r = Ra_{\overline{n}r} - P$
$S = R\left(\dfrac{(1+i)^n-1}{i}\right)$	$\bar{x} = \dfrac{\sum_{i=1}^{n} x_i}{n}$
$S = Rs_{\overline{n}i}$	$\bar{x}_w = \dfrac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$
$P = Ra_{\overline{n}i}$	$\sum_{i=1}^{n} i = \dfrac{n(n+1)}{2}$
$P = R\left(\dfrac{(1+i)^n-1}{i(1+i)^n}\right)$	$S = \sqrt{\dfrac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$
$A = nR + Q\left[\dfrac{n(n-1)}{2}\right]$	$PI = \dfrac{NPV + \text{original investment}}{\text{original investment}}$

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QUESTION 1

$$simple\ \text{int}erest$$

$$P = \frac{S}{(1+rt)} = \frac{18000}{\left(1+0.0847\times\frac{20}{12}\right)}$$

$$= 15773.33$$

$$option\ 3$$

QUESTION 2

$$simple\ discount$$

$$r = \frac{d}{1-dt} = \frac{0.1429}{1-0.1429\times\frac{8}{12}}$$

$$= 15.79\%$$

$$option\ 5$$

QUESTION 3

$$compound\ \text{int}erest$$

$$FV = PV(1+i)^n$$

$$= 13300\left(1+\frac{0.1135}{6}\right)^{6\times\frac{38}{12}}$$

$$= 18988.31$$

$$option\ 5$$

QUESTION 4

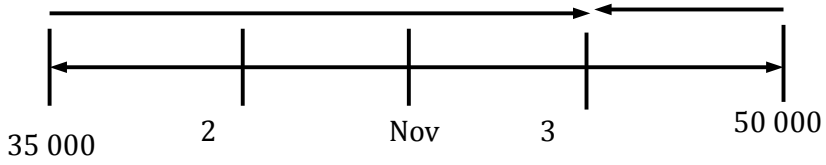
$$\text{continous compounding}$$

$$S = Pe^{ct}$$

$$P = \frac{S}{e^{ct}} = \frac{32\,412.87}{e^{0.105\times\frac{57}{52}}}$$

$$= 29\,000$$

QUESTION 5



$$S = 35\,000\left(1+\frac{0.113}{2}\right)^{7\times2} = 75\,551.82$$

$$= 50\,000\left(1+\frac{0.101}{4}\right)^{-2\times4} = \underline{40\,957.34}$$

$$\underline{\underline{116\,508.49}}$$

option 4

QUESTION 6

calculation 252 032

option 2

QUESTION 7

$$jeff = 100\left(\left(1+\frac{vm}{m}\right)^{m}-1\right)$$

$$29.61 = 100\left(\left(1+\frac{vm}{52}\right)^{52}-1\right)$$

$$vm = 26\%$$

$$option \quad 1$$

QUESTION 8

$$S = Rs\,\bar{n}\,i$$

$$200\,000 = Rs\,\overline{12\times 6}\,0.084 \div 12$$

$$R = 2145.84$$

QUESTION 9

$$1 = \Pr t$$

$$= 200\,000 \times 0.156 \times \frac{4}{12}$$

$$= 10\,400$$

$$Total\ yearly\ \cos t = 4\times 10\,400 + 12\times 2145.84$$

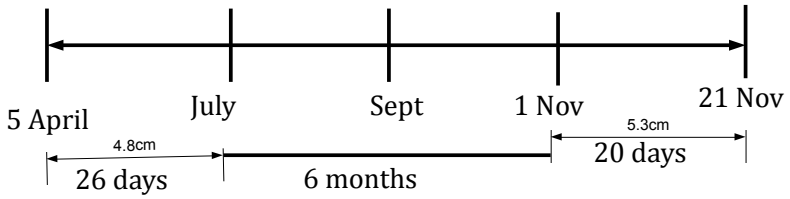
$$= 67\,350$$

$$option \quad 5$$

QUESTION 10

$$\begin{aligned}
&\textit{Pertuity}\\
&R = iP\\
&= \frac{0.0791}{4} \times 1250000\\
&= 24718.75\\
&\textit{option } 1
\end{aligned}$$

QUESTION 11



$$S = P(1+rt) = 75000\left(1 + 0.0837 \times \frac{26}{36}\right)$$

$$= 75447.16$$

$$S = P(1+i)^n = 75447.16\left(1 + \frac{0.0837}{12}\right)^{12 \times \frac{6}{12}}$$

$$= 78660.20$$

$$S = P(1+rt) = 78660.20\left(1 + 0.0837 \times \frac{20}{365}\right)$$

$$= 79020.96$$

option 5

QUESTION 12

$$75\,000\left(1+\frac{0.0837}{12}\right)^{\left(\frac{6}{12}+\frac{26+20}{365}\right)\times\frac{12}{1}}$$

$$P = 79\,020.29$$

$$option \quad 3$$

$$S = P\left(1+\frac{vm}{m}\right)^{tm}$$

QUESTION 13

$$S = P\left(1+\frac{vm}{m}\right)^{tm}$$

$$9\,000 = 6\,000\left(1+\frac{0.08}{4}\right)^{4t}$$

$$\frac{9000}{6\,000} = \left(1+\frac{0.08}{4}\right)^{4t}$$

$$\ln\left(\frac{9\,000}{6\,000}\right) = 4t\ln\left(1+\frac{0.08}{4}\right)$$

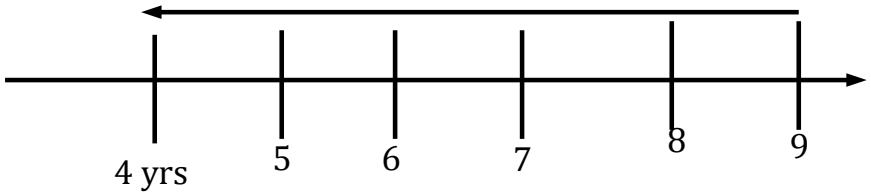
$$\frac{\ln\left(\frac{9\,000}{6\,000}\right)}{\ln\left(1+\frac{0.08}{4}\right)} = 4t$$

$$4t = 20.48$$

$$t = 5.12 \ \ years$$

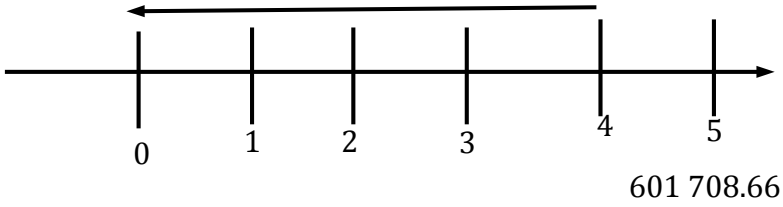
$$option \quad 2$$

QUESTION 14



$$P = Ra\,\overline{n}\,i$$
$$= 95000a\overline{2\times 5}\ 0.186 \div 2$$
$$= 601708.66$$
$option j$ 3

QUESTION 15



$$P = S(1+i)^{-n} \qquad 601708.66$$
$$= 601708.66\left(1+\frac{0.186}{2}\right)^{-2\times 4}$$
$$= 295410$$
$option$ 4

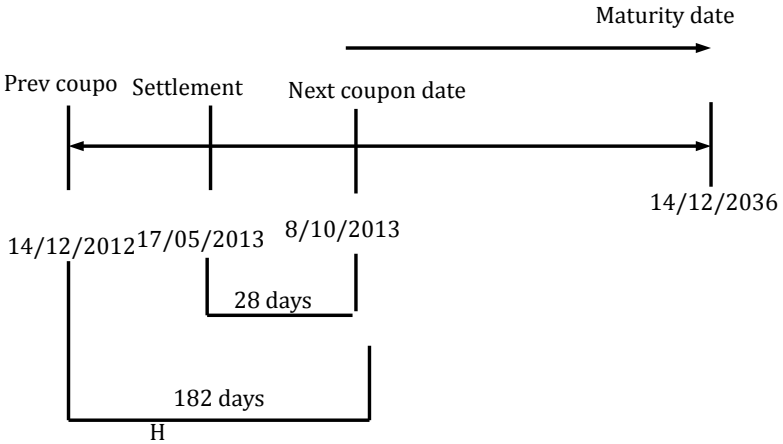
QUESTION 16

$$FV - 35\,000$$
$$PMT - 500$$
$$1/Y - 11.32$$
$$C/Y - 12$$
$$N - ?$$
$$S = Rs\,\overline{n}\,i \qquad = 35\,000 = 500\,\overline{n}\,0.1132 \div 12$$
$$n = 54\ months\ \ (calculator)$$

QUESTION 17

$$P = Ra\,\overline{n}\,i$$
$$790\,000 = Ra\,\overline{20 \times 12}\ 0.1375 \div 12$$
$$R = 9\,680.70$$
$$TV = Ra\,\overline{n}\,r\ = 9\,680.70\ \overline{20 \div 12}\ 0.092 \div 12 = 1060.749$$
$$Tr = 1060.749 - 790\,000 = 270\,749$$
$$option\ \ 3$$

QUESTION 18



$$Years = 14/12/2036 - 14/06/2013$$
$$= 23$$

We must multiply by two to get the number of half coupons and add one to get "n"

$$23 \times 2 + 1 = 47$$
$$P = da\,\overline{n}\,2 + 100(1+2)^{-n}$$
$$\frac{9.2}{2} a\,\overline{47}\,0.104 \div 2 + 100\left(1+\frac{0.104}{2}\right)^{-47}$$
$$= 83.78654 + 9.23124$$
$$= 93.01778$$
$$\therefore 93.01778 + 4.8 = 97.81778$$
$$P = 97.81778\left(1+\frac{0.104}{2}\right)^{-\frac{28}{182}}$$
$$= 97.05788$$
$$option\ 2$$

QUESTION 19

$$96.80770 - 32.09888$$
$$= 64.708820$$
$$PMT = 7.5$$
$$PV = 64.70882$$
$$N = 15$$
$$1/Y = 7.87 \quad calculator$$
$$option\ \ 1$$

QUESTION 20

$$\text{Increasing annuity}$$

$$S = \left(R + \frac{Q}{i} \right) S\bar{n}\, i - \frac{nQ}{i}$$

$$R = 3600$$

$$Q = 360$$

$$i = 0.10$$

$$n = 20$$

$$S = \left(3600 + \frac{360}{0.10}\ S\bar{n}\ 0.10 - \frac{20 \times 360}{0.10} \right)$$

$$= 412380 = 72000$$

$$= 340380$$

$$\text{option} \quad 2$$

QUESTION 21

$$S = Pe^{ct}$$

$$e^{ct} = \frac{S}{P}$$

$$\ln e^{ct} = \ln\left(\frac{S}{P} \right)$$

$$t = \frac{\ln\left(\frac{S}{P} \right)}{c}$$

$$\text{option} \quad 5$$

QUESTION 22

General annuity

$$vm = n\left(\left(1+\frac{vm}{m}\right)^{\frac{m}{n}}-1\right)$$

$n = 12$

$m = 4$

$vm = 0.0775$

$$\therefore vm = 12\left\{\left(1+\frac{0.0775}{4}\right)^{\frac{4}{12}}-1\right\}$$

$$= 7.7\%$$

$S = Rs\,\overline{n}\,i$

$= 1200\,S\overline{10\times 12}\ 0.77 \div 12$

$= 215900$

option 2

QUESTION 23

Calculator $\rightarrow$ $+/-$	500 000	*DATA*
	75 000	*DATA*
	190 000	*DATA*
	40 000	*DATA*
	150 000	*DATA*
	180 000	*DATA*

2nd F cash

2nd F CA COMP

$= 7.78\%$

option 1

QUESTION 24

continous compounding

$$C = m\ln\left(1+\frac{vm}{m}\right)$$

$$= 12\ln\left(1+\frac{0.194}{12}\right)$$

$$= 19.245\%$$

option 5

QUESTION 25

Monthly payment – principal repaid

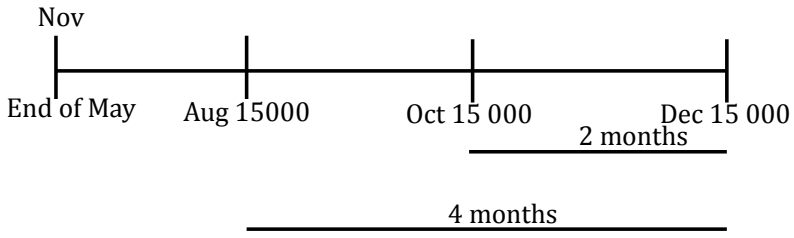
$$= \text{int}\,erest\ due\ at\ month\ end$$

$$= 2080.54 - 2014.27$$

$$= 66.27$$

option 3

QUESTION 26



$$15\,000\left(1+0.10\times\frac{4}{12}\right)=15\,500$$
$$15\,000\left(1+0.10\times\frac{2}{12}\right)=15\,250$$
$$+15\,000$$
$$45\,750$$

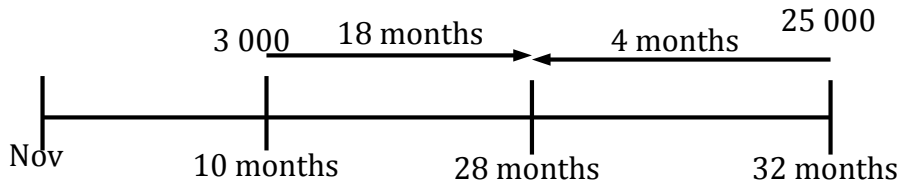
OPTION 1

QUESTION 27

$$calculator \rightarrow r = 0.90828$$

option 4

QUESTION 28



$$X\left(1+\frac{0.1475}{6}\right)^{\frac{28}{12}\times 6} = 3000\left(1+\frac{0.1475}{6}\right)^{\frac{18}{12}\times 6} + 25000\left(1+\frac{0.1475}{6}\right)^{-\frac{4}{12}\times 6}$$

$$X\left(1+\frac{0.1475}{6}\right)^{14} = 3000\left(1+\frac{0.1475}{6}\right)^{9} + 25000\left(1+\frac{0.1475}{6}\right)^{-2}$$

$$X = \frac{3000\left(1+\frac{0.1475}{6}\right)^{9} + 25000\left(1+\frac{0.1475}{6}\right)^{-2}}{\left(1+\frac{0.1475}{6}\right)^{14}}$$

$$= 19607.45$$

Approximately 19 607.48

option 5

QUESTION 29

Positive NPV

OPTION 1

PI greater than 1

IRR greater than 8.04

QUESTION 30

$$= 17\,287.42 + 2310.26$$

$$= 40\,497.68$$

option 3