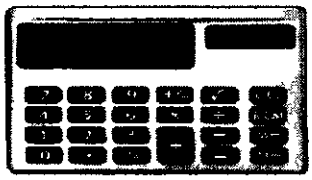
UNIVERSITY EXAMINATIONS



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

ROUGH WORK

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

ROUGH WORK

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

ROUGH WORK

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

ROUGH WORK

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

ROUGH WORK

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%

ROUGH WORK

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

ROUGH WORK

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.

ROUGH WORK

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

ROUGH WORK

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.

ROUGH WORK

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

$I = Prt$	$r = \dfrac{d}{1-dt}$
$S = P(1+rt)$	$S = (1+i)Rs_{\overline{n}i}$
$P = S(1-dt)$	$P = (1+i)Ra_{\overline{n}i}$
$S = P\left(1+\dfrac{j_m}{m}\right)^{tm}$	$P = da_{\overline{n}z} + 100(1+z)^{-n}$
$J_{eff} = 100\left(\left(1+\dfrac{j_m}{m}\right)^{m}-1\right)$	$\dfrac{H-R}{365}\times c$
$S = Pe^{ct}$	$\dfrac{-R}{365}\times c$
$j_\infty = 100(e^c-1)$	$MIRR = \left(\dfrac{C}{PV_{\text{out}}}\right)^{\frac{1}{n}} - 1$
$c = m\ln\left(1+\dfrac{j_m}{m}\right)$	$P = \frac{R}{i}$
$j_m = m\left(e^{\frac{c}{m}}-1\right)$	$S = \left[R+\frac{Q}{i}\right]s_{\overline{n}i} - \frac{nQ}{i}$
$i = n\left(\left(1+\dfrac{j_m}{m}\right)^{\frac{m}{n}}-1\right)$	$T_r = Ra_{\overline{n}r} - P$
$S = R\left(\dfrac{(1+i)^n-1}{i}\right)$	$\bar{x} = \dfrac{\sum_{i=1}^{n} x_i}{n}$
$S = Rs_{\overline{n}i}$	$\bar{x}_w = \dfrac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$
$P = Ra_{\overline{n}i}$	$\sum_{i=1}^{n} i = \dfrac{n(n+1)}{2}$
$P = R\left(\dfrac{(1+i)^n-1}{i(1+i)^n}\right)$	$S = \sqrt{\dfrac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$
$A = nR + Q\left[\dfrac{n(n-1)}{2}\right]$	$PI = \dfrac{NPV + \text{original investment}}{\text{original investment}}$

UNIVERSITY OF SOUTH AFRICA UNISA university of south africa UNIVERSITEIT VAN SUID-AFRIKA

EXAMINATION MARK READING SHEET EKSAMEN-MERKLEESBLAD

PART 1 (GENERAL/ALGEMEEN) DEEL 1

STUDY UNIT e.g. PSY100-X
STUDIE EENHEID bv PSY100-X

1

PAPER NUMBER
VRAESTELNOMMER

2

INITIALS AND SURNAME
VOORLETTERS EN VAN

3

DATE OF EXAMINATION
DATUM VAN EKSAMEN

4

EXAMINATION CENTRE (E.G. PRETORIA)
EKSAMENSENTRUM (BV. PRETORIA)

5

STUDENT NUMBER
STUDENTENOMMER

6

7

UNIQUE PAPER NO
UNIEKE VRAESTEL NR

8

9

For use by examination invigilator

Vir gebruik deur eksamenopsiener

IMPORTANT

1. USE ONLY AN HB PENCIL TO COMPLETE THIS SHEET
2. MARK LIKE THIS
3. CHECK THAT YOUR INITIALS AND SURNAME HAS BEEN FILLED IN CORRECTLY
4. ENTER YOUR STUDENT NUMBER FROM LEFT TO RIGHT
5. CHECK THAT YOUR STUDENT NUMBER HAS BEEN FILLED IN CORRECTLY
6. CHECK THAT THE UNIQUE NUMBER HAS BEEN FILLED IN CORRECTLY
7. CHECK THAT ONLY ONE ANSWER PER QUESTION HAS BEEN MARKED
8. DO NOT FOLD

BELANGRIK

1. GEBRUIK SLEGS 'N HB POTLOOD OM HIERDIE BLAD TE VOLTOOI
2. MERK AS VOLG
3. KONTROLEER DAT U VOORLETTERS EN VAN REG INGEVUL IS
4. VUL U STUDENTENOMMER VAN LINKS NA REGS IN
5. KONTROLEER DAT U DIE KORREKTE STUDENTENOMMER VERSTREK HET
6. KONTROLEER DAT DIE UNIEKE NOMMER REG INGEVUL IS
7. MAAK SEKER DAT NET EEN ALTERNATIEF PER VRAAG GEMERK IS
8. MOENIE VOU NIE

PART 2 (ANSWERS/ANTWOORDE) DEEL 2

10

1	c1 c2 c3 c4 c5	36	c1 c2 c3 c4 c5	71	c1 c2 c3 c4 c5	106	c1 c2 c3 c4 c5
2	c1 c2 c3 c4 c5	37	c1 c2 c3 c4 c5	72	c1 c2 c3 c4 c5	107	c1 c2 c3 c4 c5
3	c1 c2 c3 c4 c5	38	c1 c2 c3 c4 c5	73	c1 c2 c3 c4 c5	108	c1 c2 c3 c4 c5
4	c1 c2 c3 c4 c5	39	c1 c2 c3 c4 c5	74	c1 c2 c3 c4 c5	109	c1 c2 c3 c4 c5
5	c1 c2 c3 c4 c5	40	c1 c2 c3 c4 c5	75	c1 c2 c3 c4 c5	110	c1 c2 c3 c4 c5
6	c1 c2 c3 c4 c5	41	c1 c2 c3 c4 c5	76	c1 c2 c3 c4 c5	111	c1 c2 c3 c4 c5
7	c1 c2 c3 c4 c5	42	c1 c2 c3 c4 c5	77	c1 c2 c3 c4 c5	112	c1 c2 c3 c4 c5
8	c1 c2 c3 c4 c5	43	c1 c2 c3 c4 c5	78	c1 c2 c3 c4 c5	113	c1 c2 c3 c4 c5
9	c1 c2 c3 c4 c5	44	c1 c2 c3 c4 c5	79	c1 c2 c3 c4 c5	114	c1 c2 c3 c4 c5
10	c1 c2 c3 c4 c5	45	c1 c2 c3 c4 c5	80	c1 c2 c3 c4 c5	115	c1 c2 c3 c4 c5
11	c1 c2 c3 c4 c5	46	c1 c2 c3 c4 c5	81	c1 c2 c3 c4 c5	116	c1 c2 c3 c4 c5
12	c1 c2 c3 c4 c5	47	c1 c2 c3 c4 c5	82	c1 c2 c3 c4 c5	117	c1 c2 c3 c4 c5
13	c1 c2 c3 c4 c5	48	c1 c2 c3 c4 c5	83	c1 c2 c3 c4 c5	118	c1 c2 c3 c4 c5
14	c1 c2 c3 c4 c5	49	c1 c2 c3 c4 c5	84	c1 c2 c3 c4 c5	119	c1 c2 c3 c4 c5
15	c1 c2 c3 c4 c5	50	c1 c2 c3 c4 c5	85	c1 c2 c3 c4 c5	120	c1 c2 c3 c4 c5
16	c1 c2 c3 c4 c5	51	c1 c2 c3 c4 c5	86	c1 c2 c3 c4 c5	121	c1 c2 c3 c4 c5
17	c1 c2 c3 c4 c5	52	c1 c2 c3 c4 c5	87	c1 c2 c3 c4 c5	122	c1 c2 c3 c4 c5
18	c1 c2 c3 c4 c5	53	c1 c2 c3 c4 c5	88	c1 c2 c3 c4 c5	123	c1 c2 c3 c4 c5
19	c1 c2 c3 c4 c5	54	c1 c2 c3 c4 c5	89	c1 c2 c3 c4 c5	124	c1 c2 c3 c4 c5
20	c1 c2 c3 c4 c5	55	c1 c2 c3 c4 c5	90	c1 c2 c3 c4 c5	125	c1 c2 c3 c4 c5
21	c1 c2 c3 c4 c5	56	c1 c2 c3 c4 c5	91	c1 c2 c3 c4 c5	126	c1 c2 c3 c4 c5
22	c1 c2 c3 c4 c5	57	c1 c2 c3 c4 c5	92	c1 c2 c3 c4 c5	127	c1 c2 c3 c4 c5
23	c1 c2 c3 c4 c5	58	c1 c2 c3 c4 c5	93	c1 c2 c3 c4 c5	128	c1 c2 c3 c4 c5
24	c1 c2 c3 c4 c5	59	c1 c2 c3 c4 c5	94	c1 c2 c3 c4 c5	129	c1 c2 c3 c4 c5
25	c1 c2 c3 c4 c5	60	c1 c2 c3 c4 c5	95	c1 c2 c3 c4 c5	130	c1 c2 c3 c4 c5
26	c1 c2 c3 c4 c5	61	c1 c2 c3 c4 c5	96	c1 c2 c3 c4 c5	131	c1 c2 c3 c4 c5
27	c1 c2 c3 c4 c5	62	c1 c2 c3 c4 c5	97	c1 c2 c3 c4 c5	132	c1 c2 c3 c4 c5
28	c1 c2 c3 c4 c5	63	c1 c2 c3 c4 c5	98	c1 c2 c3 c4 c5	133	c1 c2 c3 c4 c5
29	c1 c2 c3 c4 c5	64	c1 c2 c3 c4 c5	99	c1 c2 c3 c4 c5	134	c1 c2 c3 c4 c5
30	c1 c2 c3 c4 c5	65	c1 c2 c3 c4 c5	100	c1 c2 c3 c4 c5	135	c1 c2 c3 c4 c5
31	c1 c2 c3 c4 c5	66	c1 c2 c3 c4 c5	101	c1 c2 c3 c4 c5	136	c1 c2 c3 c4 c5
32	c1 c2 c3 c4 c5	67	c1 c2 c3 c4 c5	102	c1 c2 c3 c4 c5	137	c1 c2 c3 c4 c5
33	c1 c2 c3 c4 c5	68	c1 c2 c3 c4 c5	103	c1 c2 c3 c4 c5	138	c1 c2 c3 c4 c5
34	c1 c2 c3 c4 c5	69	c1 c2 c3 c4 c5	104	c1 c2 c3 c4 c5	139	c1 c2 c3 c4 c5
35	c1 c2 c3 c4 c5	70	c1 c2 c3 c4 c5	105	c1 c2 c3 c4 c5	140	c1 c2 c3 c4 c5