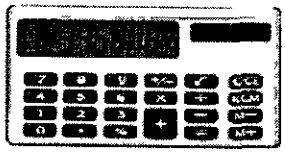
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (481737) May/June 2014

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 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 formulae, 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.

Question 1

On 21 January 2014 Nicci invested an amount in an account earning 6,5% simple interest If she has R1 200 available on 9 May 2014, then the amount that she invested on 21 January was

[1] R1 006,43
[2] R1 176,92
[3] R1 177,36
[4] R1 177,85
[5] R1 223,08

Question 2

Karin won R165 000 and decided to deposit 65% of this amount in an account earning 8,25% interest, compounded every four months The accumulated amount after five years equals

[1] R151 490,63
[2] R161 110,84
[3] R161 332,31
[4] R247 862,83
[5] R248 203,55

Question 3

How long will it take you to save R4 000 for a new phone if you deposit R100 at the end of every month into a savings account which pays 9% per annum, compounded monthly? Answers are given to the nearest month

[1] 18 months
[2] 35 months
[3] 48 months
[4] 494 months
[5] None of the above

Question 4

The effective rate for a continuous compounding rate of 17,5% is

[1] 16,13%
[2] 17,5%
[3] 19,12%
[4] 20,13%
[5] 21,076%

ROUGH WORK

Questions 5 and 6 relate to the following situation:
Maria Mahlangu intends to open her Sew and Go shop on 25 October 2014. On 6 February 2014 she deposited R50 000 into an account that earns 8,9% per year compounded every two months The interest is calculated on 1 January, 1 March, 1 May, 1 July, 1 September, 1 November of each year

Question 5

If simple interest is used for odd periods and compounded interest for the rest, the amount of money that Maria will have available when she opens her shop will equal

[1] R53 182,05
[2] R53 205,54
[3] R53 230,28
[4] R53 243,19
[5] none of the above

Question 6

If fractional compounding is used for the whole period then the amount that Maria will have available when she opens her shop will equal

[1] R53 124,55
[2] R53 163,77
[3] R53 228,37
[4] R53 241,26
[5] none of the above

Question 7

Bobo borrows money from the bank at a simple discount rate of 9,75% She must pay the bank R35 000 in 27 months' time The amount of money that she receives from the bank now equals

[1] R27 321,88
[2] R28 389,51
[3] R28 703,23
[4] R42 678,13
[5] R44 835,87

ROUGH WORK

Question 8

A student registered for a four-year degree She has a fund of R40 000 available to cover expenses over the next four years The amount of periodic withdrawals at the **beginning of each month** if the interest rate is 7,5% compounded monthly is

[1] R833,33
[2] R712,70
[3] R961,15
[4] R967,16
[5] none of the above

Question 9

Juan's investment of R1 050 000 in the Keep the Ball shop 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) equals

[1] 6,706%
[2] 7,94%
[3] 12,41%
[4] 14,76%
[5] none of the above

Question 10

If 15% interest is compounded every two months then the equivalent weekly compounded rate equals

[1] 14,464%
[2] 14,484%
[3] 14,816%
[4] 14,837%
[5] none of the above

ROUGH WORK

Question 11

Pippa has to pay off a loan of R7 000 due now and a loan of R2 000 due in 14 months' time in three payments in two five and ten months' time respectively The second payment is to be double the first and the third payment is to be triple the first What is the size of the payment at month five if interest is calculated at 16% per year, compounded monthly?

[1] R1 582,43
[2] R3 000,00
[3] R3 164,86
[4] R4 500,00
[5] R4 627,26

Question 12

After a car accident due to a faulty tyre, Flat Tyre Company agreed to pay Kobelo, one of the drivers of the Speedy Taxi services, R6 825 per month **indefinitely** Money is worth 12,6% per year, compounded monthly The amount of money that Flat Tyre Company must have available now to fund the payments to Kobelo equals

[1] R505 561,30
[2] R650 000,00
[3] R982 800,00
[4] R2 275 116,23
[5] none of the above

Question 13

Six years ago Trevor lent Maria R150 000 on the condition that she would pay him back in nine years' time The applicable interest rate is 15,5% per year, compounded monthly Maria also owes Trevor another amount of R250 000 that she has to pay back six years from now for a loan that earned interest at 16,4% per year, compounded half-yearly Maria asks Trevor if she can settle both her debts three years from now The total amount that Maria will have to pay Trevor 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

ROUGH WORK

Question 14

Thandi took out an endowment policy that matures in 30 years The expected interest rate per year is 11,15% compounded once a year Her first yearly payment is R7 500, after which the yearly payments will increase with R800 each year The amount that she can expect to receive on the maturity date will be

[1] R1 536 240,75
[2] R1 700 106,43
[3] R2 790 641,47
[4] R3 005 888,11
[5] R5 916 785,00

Question 15

The initial investment into the Beautiful Me Shop as the only cash outflow was R400 000 If the profitability index is 1,0875, the net present value (NPV) equals

[1] R35 000
[2] R367 816
[3] R435 000
[4] R835 000
[5] none of the above

Question 16

Rinaldo bought a house and managed to secure a home loan for R650 000 with monthly payments of R8 439,31 at a fixed interest rate of 14,75% per year, compounded monthly over a period of 20 years If an average yearly inflation rate of 8,75% is expected, then the real cost of the loan will approximately equal

[1] R291 307
[2] R304 986
[3] R941 307
[4] R954 986
[5] none of the above

ROUGH WORK

Questions 17 and 18 relate to the following situation:
The following table represents the number of children in a certain school's traveling distance each day to school Assume that a linear relationship exists between the distance from school (x) and number of children (y)

Approximately distance from school in km *(x)*	***Number of children*** *(y)*
3,50	*10*
3,00	*5*
2,75	*15*
2,00	*12*
1,50	*20*
1,25	*18*
1,00	*22*
0,90	*20*
0,80	*27*
0,70	*25*
0,60	*35*

Question 17

The slope of the regression line is equal to

[1] $-7{,}08$
[2] $-0{,}86$
[3] $1{,}02$
[4] $1{,}64$
[5] $30{,}59$

Question 18

The correlation coefficient is equal to

[1] $-7{,}08$
[2] $-0{,}86$
[3] $1{,}02$
[4] $1{,}64$
[5] $30{,}59$

ROUGH WORK

Question 19

Lulu invested R25 500 that accumulated to R36 550 over a period of 54 months The applicable continuous compounding rate equals

[1] 6,7%

[2] 8,0%

[3] 8,3%

[4] 9,6%

[5] none of the above

Question 20

If $S = Rs_{\overline{n}|i}$ then n is denoted by

[1] $\frac{\ln\left(\frac{iS}{R}+1\right)}{\ln(1+i)}$

[2] $\frac{\frac{iS}{R}+1}{\ln(1+i)}$

[3] $\frac{\frac{iS}{R}-1}{\ln(1+i)}$

[4] $\frac{1}{iR}$

[5] none of the above

Question 21

Consider	BOND SES
Coupon rate	9,4% per year
Yield to maturity	10,6% per year
Settlement date	16 July 2014
Maturity date	9 October 2040
The all-in price	R91,91965%

The clean price equals

[1] R84,80721%

[2] R86,92737%

[3] R87,26217%

[4] R89,39581%

[5] R89,73061%

ROUGH WORK

Question 22

Sheena has an individual retirement plan Her money is invested into a money market fund that pays interest on a daily basis Over a two year period in which no deposits or withdrawals were made, the balance of her account grew from R4 500 to R5 268,24 The effective interest rate over this period equals

[1] 5,8%
[2] 6,1%
[3] 8,20%
[4] 8,53%
[5] 9%

Question 23

After nine years the accumulated amount of weekly deposits of R750 at an interest rate of 8,6% per year, compounded monthly, will approximately rounded to the nearest hundred rand equals

[1] R528 600,00
[2] R529 200,00
[3] R530 000,00
[4] R675 000,00
[5] R696 000,00

Question 24

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

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

ROUGH WORK

Question 25

The following table represents the cash flows (in rand) of the Sit Comfortable Shop

Year	Cash flows
3	40 000
5	−70 000
7	−80 000
9	10 000
11	100 000

Money can be borrowed at 14,25% per year and investments can earn 8,27% per year If the future value of the cash inflows is R187 253,00, then the MIRR equals

[1] 8,85%
[2] 9,73%
[3] 13,62%
[4] 22,66%
[5] none of the above

Question 26

Determine the simple interest rate which is equal to a simple discount rate of 12% per year for a period of 18 months

[1] 0,12%
[2] 10,34%
[3] 12,00%
[4] 14,63%
[5] None of the above

ROUGH WORK

Questions 27 and 28 relate to the following situation:
The last six payments of a loan are reflected in the following amortisation schedule

Month	***Outstanding principal at the beginning of the month***	***Interest due at the end of the month***	***Payment***	***Principal repaid***
175	*49 694,10*	*422,40*	*8 530,49*	*8 108,09*
176	*A*	*353,48*	*8 530,49*	*F*
177	*33 409,01*	*C*	*8 530,49*	*G*
178	*25 162,50*	*D*	*8 530,49*	*8 316,61*
179	*B*	*143,19*	*8 530,49*	*H*
180	*8 458,59*	*E*	*8 530,49*	*I*

Question 27

The applicable interest rate per year (compounded monthly) is

[1] 4,95%
[2] 5,2%
[3] 8,5%
[4] 10,2%
[5] 12,70%

Question 28

The value of A equals

[1] R40 540,45
[2] R40 810,13
[3] R41 163,61
[4] R41 586,01
[5] R42 652,45

ROUGH WORK

Question 29

Consider	Stock DEF
Coupon rate	10,9% per year
Yield to maturity	8,7% per year
Settlement date	12 August 2014
Maturity date	8 March 2044

The all-in price is equal to

[1] R122,46930%

[2] R123,23691%

[3] R127,88535%

[4] R128,68691%

[5] none of the above

Question 30

Naomi decides to save to discharge a loan of R500 000 six years from now, using the sinking fund method The loan'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 The monthly deposit into the sinking fund will equal

[1] R4 236,10

[2] R5 364,60

[3] R10 736,10

[4] R12 958,53

[5] R16 235,96

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**

FORMULAE

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

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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