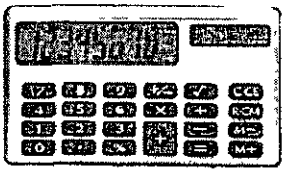
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

DSC1630 (496431) October/November 2017

Department of Decision Sciences
Introductory Financial Mathematics

Duration 2 Hours 100 Marks

EXAMINERS

FIRST MRS MF IMMELMAN
SECOND MS WA VAN HOEPEN

Programmable pocket calculator is permissible

Closed book examination.

This paper consists of 23 pages, including a list of formulas, a table with the number of each day of the year, ten sheets of paper for rough work and 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* the 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

In 20 months' time, Joan will need R18 000. For this she opens a savings account that earns 8,47% simple interest per year. The amount that she must invest now is

[1] R15 459,00
[2] R15 718,93
[3] R15 773,33
[4] R16 813,26
[5] R20 541,00

Question 2

Luke receives a gift of R5 000 from his uncle. He invests the money and earns 12% interest per annum, compounded monthly. The time that he has to wait for this amount to grow to R10 034 is

[1] 60 months
[2] 65 months
[3] 70 months
[4] 15 months
[5] none of the above

Question 3

Mareli borrowed R900 from Sandile and R850 from Jonah. She has to repay the amounts with interest added eight months from now. Sandile and Jonah both charge her an interest rate of 15% per annum, compounded monthly. The total amount that Mareli will pay Sandile and Jonah eight months from now is

[1] R994,04
[2] R938,81
[3] R1 923 85
[4] R1 932,85
[5] none of the above

Question 4

If a bank charges 12% interest, compounded quarterly, the effective annual interest rate that the bank charges is

[1] 12,68%
[2] 289,6%
[3] 4,06%
[4] 12,55%
[5] none of the above

ROUGH WORK

Question 5

Thabo will need R36 000 in five years' time. The amount of money that he must invest now at an interest rate of 7,5% per year, compounded continuously, is

[1] R24 742,41
[2] R25 076,11
[3] R26 181,82
[4] R49 500,00
[5] R52 379,69

Question 6

Jonas needs R14 500 now to buy a hi-fi-system. Loud-and-Clear is prepared to lend him the money on condition that he will pay back the money in ten months' time. If Loud-and-Clear charges a 28% simple discount rate, then the value that Jonas has to pay back is

[1] R11 116,67
[2] R11 756,76
[3] R17 883,33
[4] R18 261,62
[5] R18 913,04

Question 7

Suppose you open an account into which you deposit R2 000 at the end of every six months for 12 years. The account pays 12,5% interest per year, compounded half-yearly. The amount that will be available in the account at the end of 12 years is

[1] R24 531,12
[2] R8 568,89
[3] R105 102,23
[4] R49 758,25
[5] none of the above

ROUGH WORK

Question 8

A customer buys goods to the value of R1 500 He does not pay the R1 500 immediately Instead he pays only R450 after one month and another R600 two months after the first payment The store uses an interest rate of 11,5% per annum, compounded monthly The final amount that the customer has to pay one year after the date of purchase to settle his debt is

[1] R450,00
[2] R504,57
[3] R528 33
[4] R531,98
[5] none of the above

Question 9

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

[1] 19,24%
[2] 19,56%
[3] 21 22%
[4] 21,41%
[5] none of the above

Question 10

Dilly Dolly sold one of her properties for a profit of R1 500 000 She decides to invest this money in an account earning 9,76% interest per year, compounded quarterly The quarterly interest paid out to her every quarter for an **indefinite** period of time amounts to

[1] R26 912,00
[2] R36 600,00
[3] R48 800,00
[4] R146 400,00
[5] R375 000,00

Question 11

On 6 October 2005, Silo invested R2 500 in an account earning 4,5% simple interest This amount would have accumulated to R2 568,42 on

[1] 6 December 2005
[2] 25 February 2006
[3] 1 March 2006
[4] 16 May 2006
[5] 23 May 2006

ROUGH WORK

Question 12

Peter asks your opinion about an investment He has to choose between three investments
Investment A $IRR = 12{,}00\%$, $PI = 0{,}78$ and $NPV = -\text{R}40\,000$
Investment B $IRR = 18{,}00\%$, $PI = 1{,}45$ and $NPV = \text{R}20\,000$
Investment C $IRR = 22{,}00\%$, $PI = 0{,}51$ and $NPV = \text{R}3\,000$
If the cost of capital is 16%, Peter should invest in

[1] investment A
[2] investment B
[3] investment C
[4] investment A or C
[5] none of the investments

Question 13

Adrian bought a second-hand car for R60 000 by obtaining a bank loan bearing interest at 15,75% per year, compounded half yearly, for a period of five years The size of each half-yearly payment to settle his debt is

[1] R1 339,65
[2] R2 914,65
[3] R4 166,42
[4] R8 891,42
[5] none of the above

Question 14

Consider the following bond
Bond LLL
Coupon 11% per year
Redemption date 1 March 2032
Yield to maturity 13,75% per year
Settlement date 28 September 2017
The bond is sold at

[1] a discount
[2] a premium
[3] par
[4] face value
[5] none of the above

ROUGH WORK

Question 15

The table below is an extract from an amortisation schedule A loan of R150 000 has to be repaid in five years in equal monthly payments at an interest rate of 18% per year, compounded monthly

Month	Outstanding principal at month beginning	Interest due at month end (simple)	Payment	Principal repaid
1	150 000,00	2 250,00	3 809,01	1 559,01
2	B	2 226,61	3 809,01	1 582,40
3	146 858,59	A	3 809,01	1 606,13
4	145 252,46	2 178,79	3 809,01	1 630,22
5	143 622,24	2 154,33	3 809,01	1 654,68

The values of A and B are

[1] $A = \text{R}2\,202{,}88$ and $B = \text{R}147\,773{,}39$

[2] $A = \text{R}2\,226{,}61$ and $B = \text{R}146\,190{,}99$

[3] $A = \text{R}2\,202{,}88$ and $B = \text{R}148\,440{,}99$

[4] $A = \text{R}5\,391{,}41$ and $B = \text{R}148\,440{,}99$

[5] none of the above

Question 16

Trivina took out an annuity with an annual payment of R6 500 that increases each year by R1 700 If money is worth 10% per annum, then after 20 years the policy is worth

[1] R200 068,74

[2] R459 257,94

[3] R874 574,99

[4] R1 005 962,49

[5] none of the above

ROUGH WORK

Questions 17 and 18 relate to the following data set.

x	1	3	5	7	9
y	143	116	100	98	90

Question 17

Use the given data to find the equation of the regression line. Round the final values to one decimal place. The equation is

[1] $y = 150{,}7 - 6{,}8x$

[2] $y = -150{,}7 + 6{,}8x$

[3] $y = 140{,}4 - 6{,}2x$

[4] $y = -140{,}4 + 6{,}2x$

[5] none of the above

Question 18

The correlation coefficient for the data set is

[1] 6,20

[2] $-0{,}93$

[3] 0

[4] $-0{,}62$

[5] 1

Question 19

A linear correlation coefficient of $r = 1$ that has been calculated for a data set means

[1] the linear relationship between two variables is weak

[2] the non-linear relationship between two variables is strong

[3] the linear relationship between two variables is strong but negative

[4] the linear relationship between two variables is strong and positive

[5] the value does not exist

ROUGH WORK

Questions 20 and 21 relate to the following situation:
The following table represents the cash inflows for Twinkle Toes Boutique

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 20

The future value (rounded to the nearest R10) of the cash inflows at the end of the project is

[1] R169 330
[2] R218 000
[3] R250 000
[4] R271 470
[5] R326 950

Question 21

The MIRR equals

[1] 14,72%
[2] 21,25%
[3] 31,90%
[4] 38,06%
[5] 41,91%

ROUGH WORK

Question 22

Adriana's investment with an initial outlay of R225 000 returns a constant cash flow of R36 000 per annum for 15 years The internal rate of return on the investment equals

[1] 6,01%
[2] 6,25%
[3] 13,65%
[4] 14,46%
[5] none of the above

Question 23

Harry wants to open the Fake Crown Jewels shop on 19 May 2018 On 17 November 2016, he invested R520 000 into an account earning 10,37% interest, compounded quarterly Compound interest is calculated on the first day of the first month of every quarter in the year, namely 1 January, 1 April, 1 July and 1 October If simple interest of 10,37% per year is used for the odd periods and compound interest for the full quarters, then the amount of money that Harry will have available on 19 May 2018 equals

[1] R606 439 13
[2] R606 539,88
[3] R606 607,03
[4] R606 710,07
[5] R607 393,35

Question 24

Josh purchased an apartment for R550 000 After paying a deposit of R100 000, he finances the balance with a loan earning 12% interest per year, compounded monthly, with and monthly payments of R4 628,76 How long will it approximately take him to settle his debt?

[1] 24 months
[2] 30 months
[3] 79 months
[4] 360 months
[5] None of the above

ROUGH WORK

Question 25

The equation for the present value of Bond XXX on 8/12/2017 is

$$P(8/12/2017) = \frac{5}{2} a_{\overline{6}|0,12-2} + 100\left(1 + \frac{0{,}12}{2}\right)^{-6}$$
$$f = \frac{33}{184}$$

and the accrued interest is equal to R2,06849%
The all-in price of Bond XXX equals

[1] R79,86029%
[2] R82,33420%
[3] R84,40269%
[4] R86,41118%
[5] none of the above

Questions 26 and 27 relate to the following situation
Consider Bond ABC
Coupon rate 9,91% per year
Yield to maturity 7,47% per year
Settlement date 17 June 2017
Maturity date 11 January 2046

Question 26

The value of n is

[1] 57
[2] 28
[3] 58
[4] 56
[5] 29

Question 27

If the all-in price of the bond is R132,93158%, then the clean price is

[1] R104,26266%
[2] R128,66892%
[3] R132,93158%
[4] R133,58319%
[5] none of the above

ROUGH WORK

Question 28

Fred owes Mary

R500 due in two months,
R1 000 due in five months,
R1 500 due in eight months and
R200 due in 18 months

He wants to discharge his obligations with three equal payments one due in three months, one due in six months and one due in ten months If interest is compounded monthly at 15% per year at the end of ten months, each payment amounts to

[1] R1 111,71
[2] R1 061,54
[3] R1 074,21
[4] R1 172,46
[5] none of the above

Question 29

Monthly payments of R1 200 are made into an account earning 7,75% interest per year, compounded **quarterly** The accumulated amount rounded to the nearest R100 after ten years is

[1] R144 000
[2] R215 900
[3] R216 500
[4] R291 100
[5] none of the above

Question 30

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 equals

[1] R38 117 25
[2] R41 307,07
[3] R49 591,37
[4] R51 538,80
[5] R311 882,75

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**

FORMULAS

$$I = Prt$$

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

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

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

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

$$S = Pe^{ct}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$PI = \frac{NPV + \text{Original investment}}{\text{Original investment}}$$

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

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

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

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

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

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

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

$$y = a + bx$$

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

UNIQUE PAPER NO
UNIEKE VRAESTEL NR

8

7

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