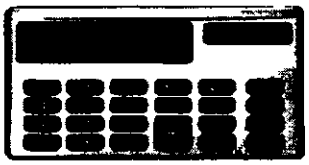
UNIVERSITY EXAMINATIONS



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 $\text{PV}_{\text{out}}$, 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

$$I = Prt$$

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

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

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

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

$$S = Pe^{ct}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## ROUGH WORK

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