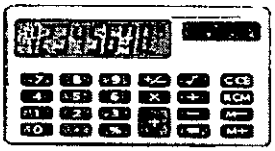
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

QMI1500 (496455) May/June 2017

ELEMENTARY QUANTITATIVE METHODS

Duration 2 Hours 100 Marks

EXAMINERS

FIRST MR P MACHAKA
SECOND MRS MC STRYDOM

Programmable pocket calculator is permissible

Closed book examination

This paper consists of 20 pages, including a list of formulas (p 20) and instructions for completing the mark-reading sheet

Answer ALL questions

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 and carefully follow the instructions for completing it Also pay attention to the following

- Only one option (indicated as [1] [2] [3] [4]) 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
- The paper consists of 30 questions for a total of 100 marks

You are strongly advised to write your name on the mark-reading sheet. In the event that you enter your student number incorrectly, we will still be able to link you to the mark-reading sheet.

Question 1

The cost of fish has increased in the ratio of 9 7 If the original cost was R5 60 per kg, what is the new price?

[1] R4 35

[2] R7 20

[3] R50 40

[4] R39 50

Question 2

A nurse has two solutions that contain different concentrations of a certain medication One is a 12 5% concentration and the other is a 5% concentration How many millilitres of each should she mix to obtain 20 millilitres of an 8% concentration?

[1] 4 mℓ at 12 5% and 16 mℓ at 5%

[2] 16 mℓ at 12 5% and 4 mℓ at 5%

[3] 8 mℓ at 12 5% and 12 mℓ at 8%

[4] 12 mℓ at 12 5% and 8 mℓ at 8%

Question 3

Six men and eight women have volunteered to serve on a committee How many different committees can be formed containing three men and three women?

[1] 4 032

[2] 3 360

[3] 1 120

[4] 2 240

Question 4

A car dealer is offering any four of six special options at the same price on a specially equipped car How many different choices of specially equipped cars do you have?

[1] 15

[2] 30

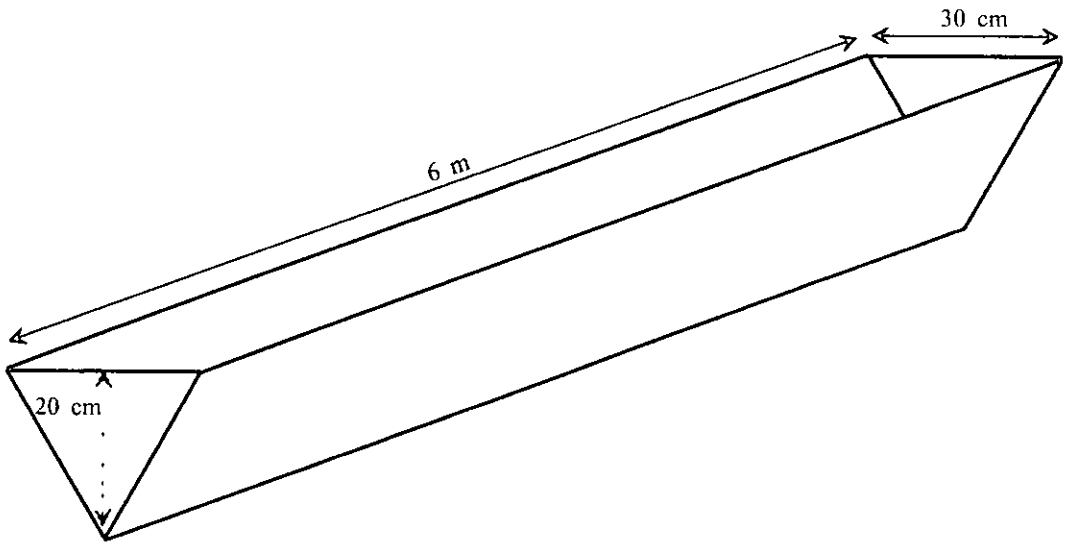
[3] 120

[4] 12

ROUGH WORK

Question 5

A horizontal drinking trough for cattle is in the shape of a triangular prism It is 6 m long and the cross-section is in the shape of a triangle with base length 30 cm and height 20 cm What is the capacity of the tank in litres?



[1] 360 litres

[2] 180 litres

[3] 36 litres

[4] 18 litres

Questions 6, 7, 8 and 9 are based on the following information
Suppose a company has ten employees, one earning R160 000, one earning R120 000, two earning R60 000, one earning R40 000, and five earning R32 000

Question 6

What is the mean salary for the company?

[1] R40 000

[2] R36 000

[3] R60 000

[4] R32 000

Question 7

What is the median salary?

[1] R40 000

[2] R36 000

[3] R60 000

[4] R32 000

ROUGH WORK

Question 8

What is the mode of the salaries?

[1] R40 000
[2] R36 000
[3] R60 000
[4] R32 000

Question 9

What is the standard deviation of the salaries?

[1] R40 000 00
[2] R44 621 87
[3] R38 416 55
[4] R41 583 12

Questions 10 and 11 are based on the following information:
An index of clothing prices for 2005 based on 1998 is to be constructed The clothing items considered are socks and ties The information for prices and quantities for both years is given below Use 1998 as the base period and 100 as the base value

	1998		*2005*	
Item	***Price (P)***	***Quantity***	***Price (R)***	***Quantity***
Ties (each)	*75*	*500*	*85*	*520*
Socks (pair)	*40*	*1200*	*45*	*1300*

Question 10

Determine the Laspeyres price index

[1] 98 9
[2] 103 7
[3] 112 9
[4] 106 4

Question 11

Determine the Paasche price index

[1] 98 9
[2] 103 7
[3] 112 9
[4] 106 4

ROUGH WORK

Question 12

Assume that in the year 2014 the Consumer Price Index (CPI) was 102 7 in February and 110 5 in November An employee's wage was R20 000 in February and R22 145 in November In relation to the value of the rand in November, his wage has

[1] increased by R2 145 00

[2] decreased by R566 52

[3] decreased by R395 15

[4] increased by R566 52

Question 13

Simplify (to two decimal places) $8^{\frac{2}{3}} + \log_2 32$

[1] 9 00

[2] 6 37

[3] 18 00

[4] 27 63

Question 14

The sum

$$\sum_{i=3}^{5} i^2$$

is equal to

[1] 25

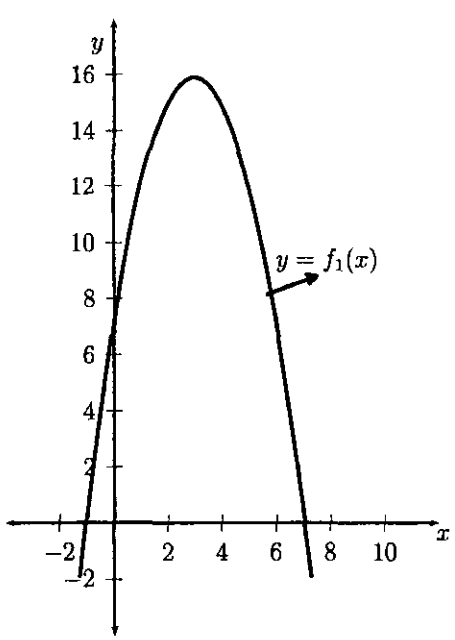
[2] 50

[3] 16

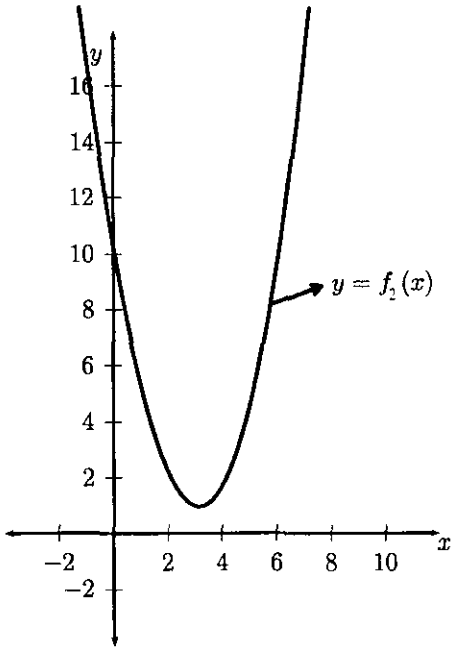
[4] 9

ROUGH WORK

Questions 15 and 16 are based on the following graphs below



(a)



(b)

Question 15

Determine the vertex of the graphs (a) and (b) respectively

[1] (a) $(3, 16)$ and (b) (3,1)

[2] (a) (0,7) and (b) (0,10)

[3] (a) $(-1, 0)$ and (b) (7,0)

[4] (a) (1,3) and (b) (0 0)

Question 16

Determine the x-intercepts of each graph

[1] (a) (3,16) and (b) (3,1)

[2] (a) (1,3), (0,7) and (b) (0,10)

[3] (a) $(-1, 0)$ and (b) (7,0)

[4] (a) $(-1, 0)$,(7,0) and (b) none

ROUGH WORK

Questions 17 and 18 are based on the following information

CDF Appliances has assembly plants in Umlazi and Illovo, where they produce a variety of kitchen appliances, including a 12-cup coffee maker and a cappuccino machine. At the Umlazi plant, 160 of the 12-cup models and 200 of the cappuccino machines can be assembled every hour. At the Illovo plant, 800 of the 12-cup models and 200 of the cappuccino machines can be assembled every hour. CDF Appliances expects orders for at least 64 000 of the 12-cup models and at least 40 000 of the cappuccino machines. At each plant, the number of assembly hours available for these two appliances is constrained by each plant's capacity and the need to fill the orders. Let x be the number of assembly hours at the Umlazi plant and let y be the number of assembly hours at the Illovo plant.

Question 17

Write the system of inequalities that describes these assembly plant constraints.

[1] $160x + 800y \geq 40\,000,\ 200x + 200y \geq 64\,000,\ x \geq 0,\ y \geq 0$

[2] $160x + 800y \geq 64\,000,\ 200x + 200y \geq 40\,000,\ x \geq 0,\ y \geq 0$

[3] $800x + 160y \geq 40\,000,\ 200x + 200y \geq 64\,000,\ x \geq 0,\ y \geq 0$

[4] $800x + 160y \geq 64\,000,\ 200x + 200y \geq 40\,000,\ x \geq 0,\ y \geq 0$

Question 18

One of the extreme points of the solution space of the system of inequalities in question 17 is

[1] $(50, 150)$

[2] $(150, 50)$

[3] $(100, 150)$

[4] $(150, 100)$

Question 19

Vuyo owns a boerewors roll stand. His profit selling boerewors rolls is given by the quadratic function

$$y = -40x^2 + 980x - 5331\,5$$

where x represents the price of a boerewors roll in rands. Vuyo wants to maximise his profit. What should the price per boerewors roll be, in order for Vuyo to maximize his profits?

[1] R8 15

[2] R24 50

[3] R12 25

[4] R16 35

ROUGH WORK

Questions 20 and 21 are based on the following information
A firm sells its product for R200 per unit. The cost per unit (per month) is $80 + x$ *where* x *represents the number of units sold per month*

Question 20

Define the marginal profit function

[1] $MP(x) = 120 - 2x$

[2] $MP(x) = 80 - 2x$

[3] $MP(x) = 120x - 80$

[4] $MP(x) = 199x - 80$

Question 21

What is the marginal profit at a production level of 20 units?

[1] R80

[2] R40

[3] R2 320

[4] R3 900

Question 22

If R8 000 is invested at 6% simple interest for nine months, find the future value of the investment

[1] R8 240

[2] R8 360

[3] R8 480

[4] R8 720

Question 23

If R5 000 is invested at 6% compounded daily for five years, find the future value of the investment (Give your answer to the nearest cent. Make the assumption that there is no leap-year in this period.)

[1] R6 749 29

[2] R6 719 58

[3] R6 749 13

[4] R6 744 25

ROUGH WORK

Question 24

You've taken out a loan of R25 000 that requires you to make equal payments of R10 000 each at the end of the next two years and to pay the outstanding balance at the end of the three years. The debt and payments are subjected to the same interest rate namely, 10% per year compounded yearly. What is the outstanding amount that you have to pay at the end of the three years?

[1] R9 500

[2] R11 275

[3] R10 175

[4] R5 000

Question 25

What lump sum will be needed to generate payments of R5 000 at the beginning of each quarter for a period of five years if money is worth 7%, compounded quarterly?

[1] R82 003 95

[2] R83 764 40

[3] R85 230 28

[4] R87 774 26

Question 26

Find the lump sum that one must invest in an annuity in order to receive R1 000 at the end of each month for the next 16 years if the annuity pays 9%, compounded monthly.

[1] R151 603 71

[2] R99 750 72

[3] R101 572 77

[4] R426 410 43

Question 27

A 42-month car loan has monthly payments of R411 35. If the interest rate is 8 1% compounded monthly, find the unpaid balance immediately after the 24th payment.

[1] R4 295 12

[2] R6 950 13

[3] R3 828 53

[4] R9 086 01

ROUGH WORK

Question 28

Find the amount of each payment if a debt of R25 000 is to be amortised with equal quarterly payments over six years and money is worth 7%, compounded quarterly

[1] R847 14

[2] R873 72

[3] R1 284 64

[4] R1 311 22

Questions 29 and 30 are based on the following information:
A man buys a house for R200 000 He makes a R50 000 down payment and agrees to amortise the rest of the debt with quarterly payments over the next ten years Interest on the debt is 12% compounded quarterly

Question 29

What is the size of the quarterly payments?

[1] R6 489 36

[2] R6 636 91

[3] R8 652 48

[4] R8 849 21

Question 30

What is the total amount of the payments?

[1] R346 099 20

[2] R265 476 40

[3] R259 574 40

[4] R353 968 40

ROUGH WORK

FORMULAS

$$I = PRT$$

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

$$P = \frac{S}{(1 + RT)}$$

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

$$P = S - D$$

$$D = Sdt$$

$$S = P \times (1 + R)^T$$

$$P = \frac{S}{(1 + R)^T}$$

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

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

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

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

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

$$CV = \frac{S}{\overline{x}}$$

$${}_mP_x = \frac{m!}{(m - x)!}$$

If $f(x) = x^n$ then $f'(x) = nx^{n-1}$

$$y = ax + b$$

$$x_m = -\frac{b}{2a}$$

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y = ax^2 + bx + c$$

$$x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$\left[\left(\frac{GDP_n}{GDP_0}\right)^{\frac{1}{n}} - 1\right] \times 100$$

$$I_n = \frac{P_n}{P_0} \times 100$$

$$P_L(n) = \frac{\sum p_n q_0}{\sum p_0 q_0} \times 100$$

$$P_P(n) = \frac{\sum p_n q_n}{\sum p_0 q_n} \times 100$$

$$Q_L(n) = \frac{\sum p_0 q_n}{\sum p_0 q_0} \times 100$$

$$Q_P(n) = \frac{\sum p_n q_n}{\sum p_n q_0} \times 100$$

$$V = \frac{\sum p_n q_n}{\sum p_0 q_0} \times 100$$

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

$$Q_D = \frac{Q_3 - Q_1}{2}$$

$${}_mC_x = \frac{m!}{(m - x)!x!}$$

If $f(x) = ax^n$, then $f'(x) = anx^{n-1}$

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

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

PAPER NUMBER
VRAESTELNOMMER

2

3 INITIALS AND SURNAME
VOORLETTERS EN VAN

4 DATE OF EXAMINATION
DATUM VAN EKSAMEN

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

5

6 STUDENT NUMBER
STUDENTENOMMER

7

8 UNIQUE PAPER NO
UNIEKE VRAESTEL NR

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

MARK READING SHEET INSTRUCTIONS

Your mark reading sheet is marked by computer and should therefore be filled in thoroughly and correctly

USE ONLY AN HB PENCIL TO COMPLETE YOUR MARK READING SHEET

PLEASE DO NOT FOLD OR DAMAGE YOUR MARK READING SHEET

Consult the illustration of a mark reading sheet on the reverse of this page and follow the instructions step by step when working on your sheet

Instruction numbers ❶ to ❿ refer to spaces on your mark reading sheet which you should fill in as follows

❶ Write your paper code in these eight squares, for instance

P	S	Y	1	0	0	-	X

❷ The paper number pertains only to first-level courses consisting of two papers

WRITE | 0 | 1 | for the first paper and | 0 | 2 | for the second If only one paper, then leave blank

❸ Fill in your initials and surname

❹ Fill in the date of the examination

❺ Fill in the name of the examination centre

❻ WRITE the digits of your student number HORIZONTALLY (from left to right) Begin by filling in the first digit of your student number in the first square on the left, then fill in the other digits, each one in a separate square

❼ In each vertical column mark the digit that corresponds to the digit in your student number as follows [-]

❽ WRITE your unique paper number HORIZONTALLY

NB Your unique paper number appears at the top of your examination paper and consists only of digits (e g 403326)

❾ In each vertical column mark the digit that corresponds to the digit number in your unique paper number as follows [-]

❿ Question numbers 1 to 140 indicate corresponding question numbers in your examination paper The five spaces with digits 1 to 5 next to each question number indicate an alternative answer to each question The spaces of which the number correspond to the answer you have chosen for each question and should be marked as follows [-]

♦ For official use by the invigilator Do not fill in any information here

Tear

attendance register (university copy) UNISA

Fill-in/MCQ

Examination period

Student number

Surname

First Names

Subject

Code of paper — Number of paper

Centre Date

This is to certify that I have read the rules governing the examinations as set out on the inside cover of this examination answer book and in the examination instructions

That the information supplied by me in this answer book is correct and valid

I undertake to adhere to the procedures rules and regulations of the University of South Africa as published in the official brochures

Signature of candidate

ID Number

Batch No
28092015MCQ

Signature of invigilator

UNISA invigilator's personnel number

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