UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

QMI1500 (478378) May/June 2016

ELEMENTARY QUANTITATIVE METHODS
DEPARTMENT OF DECISION SCIENCES

Duration 2 Hours 100 Marks

EXAMINERS
FIRST MR B MUKERU
SECOND MS J LE ROUX

Programmable pocket calculator is permissible

Closed book examination

This paper consists of 19 pages, including a list of formulas (p 19) 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] [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
- 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 simplification of the expression

$$\frac{4}{3} + \left(\frac{1}{3} + 3\frac{8}{7}\right) - \frac{6}{7}$$

gives

[1] $1\frac{20}{21}$
[2] $4\frac{20}{21}$
[3] $1\frac{8}{20}$
[4] $2\frac{13}{21}$
[5] none of the above

Question 2

If $x = 4$, the value of the sum

$$\sum_{i=0}^{3} \left(5 + \sqrt{x^i}\right)$$

is

[1] 35
[2] 34
[3] 15
[4] 14
[5] none of the above

Question 3

Simplifying the expression

$$\frac{8^x \times 8^{3x}}{2^{3x} \times 4^{x+2}},$$

one obtains

[1] $\frac{1}{64}$
[2] $2^{4(x-1)}$
[3] 2^{7x-4}
[4] $\frac{1}{8^{6x}}$
[5] none of the above

ROUGH WORK

Question 4

Solve for x in the following equation

$$\frac{3x-2}{4} - \frac{1}{4} = \frac{1-5x}{2}$$

[1] $x = 0{,}10$

[2] $x = 2{,}6$

[3] $x = \frac{5}{13}$

[4] $x = \frac{7}{23}$

[5] none of the above

Question 5

John buys 168 mangos for R354,00 and sells all the mangos for R35,00 per dozen The percentage profit, rounded to two decimal places, that he makes is

[1] 66,10%

[2] 18,64%

[3] 38,42%

[4] 6,02%

[5] none of the above

Question 6

A test is administered with ten long questions Students are allowed to answer any four of the ten questions The number of choices of the four questions is

[1] 210

[2] 5 040

[3] 34

[4] 151 200

[5] none of the above

Question 7

A piece of timber is 360 cm long and it is cut into three pieces A, B and C in the ratio of 4 6 2 The length of each of the three pieces is

[1] A = 120 cm, B = 180 cm and C = 60 cm

[2] A = 60 cm, B = 180 cm and C = 120 cm

[3] A = 80 cm, B = 120 cm and C = 40 cm

[4] A = 240 cm, B = 360 cm and C = 120 cm

[5] none of the above

ROUGH WORK

Question 8

The Legae company rents out three houses It charges rent of R2 500 more per month for the second house than for the first The third house is rented out for 85% of the rent of the second house, but was vacant for two months for renovations The yearly rent for all three houses is R400 372 If A, B and C are the monthly rents of the first, the second and the third houses respectively, then

[1] A=R10 865,59, B=R13 363,59 and C=R11 360,75

[2] A=R9 405,17, B=R11 905,17 and C=R13 690,94

[3] A=R13 880,68, B=R16 380,68 and C=R13 923,59

[4] A=R10 742,22, B=R13 242,22 and C=R11 255,88

[5] none of the above

Question 9

The slope of the line $y = ax + b$ passing through the points $\left(\frac{1}{2}, \frac{1}{3}\right)$ and $\left(2, \frac{3}{4}\right)$ is

[1] $a = \frac{15}{4}$

[2] $a = \frac{18}{5}$

[3] $a = \frac{5}{18}$

[4] $a = 7{,}5$

[5] none of the above

Question 10

Consider the system of equations

$$\begin{aligned} 3x - 2y &= 4 \\ 2x - y &= -3 \end{aligned}$$

When using substitution to solve this system of equations, the result of substituting the x-value of the second equation into the x-value of the first equation is

[1] $-y + 9 = 8$

[2] $-9 - y = 8$

[3] $-7y - 17 = 0$

[4] $y = 17$

[5] none of the above

ROUGH WORK

Question 11

Find r if

$$\sqrt{4r+3} - 2 = 3$$

[1] $r = -0{,}5$

[2] $r = 5{,}5$

[3] $r = 0{,}18$

[4] $r = 7$

[5] none of the above

Question 12

The solution to the inequality

$$-2 \leq \frac{2-6x}{8}$$

is

[1] $x \geq 3$

[2] $x \leq \frac{7}{3}$

[3] $x \leq \frac{1}{3}$

[4] $x \leq 3$

[5] none of the above

Question 13

Tebogo has R420 to spend at the amusement park It will cost him R26 for entrance to the park, R23 per ride and R40 to play some games Which inequality represents the number of possible rides r and games g, that Tebogo can ride and play?

[1] $23r + 40\text{g} \geq 394$

[2] $40r + 23\text{g} \leq 394$

[3] $23r + 40\text{g} \leq 394$

[4] $23r + 40\text{g} \leq 420$

[5] none of the above

ROUGH WORK

Question 14

The quadratic function

$$y - 6 = 3[(x-2)(x-1)]$$

can be rewritten in the form $y = ax^2 + bc + c$, where the values of the constants a, b, and c are identified as follows

[1] $a = 3$, $b = -9$ and $c = 0$

[2] $a = 3$, $b = -5$ and $c = 12$

[3] $a = 3$, $b = -9$ and $c = 12$

[4] $a = 3$, $b = 3$ and $c = -6$

[5] none of the above

Question 15

The turning point of the quadratic function

$$y = 2x^2 + 3x - 4$$

is

[1] $(x, y) = \left(\frac{3}{4}, -\frac{5}{8}\right)$

[2] $(x, y) = \left(\frac{3}{2}, 8\right)$

[3] $(x, y) = \left(-\frac{3}{4}, -5\frac{1}{8}\right)$

[4] $(x, y) = \left(-\frac{4}{3}, -4\frac{4}{9}\right)$

[5] none of the above

Question 16

The derivative of the function

$$f(x) = 6x^3 - 12x^{-2} + 4x^{\frac{3}{2}} - 6$$

is

[1] $f'(x) = 18x^2 + 6x^{\frac{1}{2}} + 24x^{-3}$

[2] $f'(x) = 18x^4 + 6x^{\frac{5}{2}} + 24x^{-1}$

[3] $f'(x) = 36x + 3x^{-\frac{1}{2}} - 72x^{-4}$

[4] $f'(x) = 6x^2 + 4x^{\frac{1}{2}} - 12x^{-3} - 6$

[5] none of the above

ROUGH WORK

Question 17

The total cost (in rand) to manufacture x watches is given by the function

$$C(x) = 1\,000 + 100x - \frac{x^2}{4}$$

The marginal cost to manufacture the 31^{th} watch is

[1] R84,50
[2] R85,00
[3] R200,00
[4] R1 185,00
[5] none of the above

Questions 18 and 19 are based on the following information
Model Traders wants to construct indexes of the prices and quantities of its two products. The prices and quantities sold in the years 2013 and 2015 are shown in the following table

	Prices (in R)		Quantities sold	
Product	2013	2015	2013	2015
A	50	60	1 300	1 600
B	40	46	1 600	2 100

Question 18

The Laspeyres price index for 2015 using 2013 as the year base is

[1] 85,09
[2] 117,52
[3] 117,44
[4] 85,15
[5] none of the above

Question 19

The Paasche price index for 2015 using 2013 as the year base is

[1] 117,52
[2] 1,18
[3] 0,85
[4] 117,44
[5] none of the above

ROUGH WORK

Question 20

Alexander Industries has just had a very profitable year The owner has decided to invest R225 000 of the profits for fifteen years in a venture that pays 9% simple interest per year How much more would the investment be worth if the owner could have received 10% simple interest per year?

[1] R138 572 16

[2] R258 750 00

[3] R33 750,00

[4] R120 322,28

[5] none of the above

Questions 21 and 22 are based on the following information:
Robert buys a new car that costs R240 000 He made a down payment of R100 000 and obtained a five-year loan for the balance at an interest rate of 8,5% per annum, compounded monthly

Question 21

What is the monthly payment of the loan?

[1] R4 923,80

[2] R2 051,58

[3] R2 872,32

[4] R35 528,20

[5] none of the above

Question 22

The outstanding principal at the beginning of the second year, rounded to the nearest rand, is

[1] R199 761

[2] R116 527

[3] R152 375

[4] R83 233

[5] none of the above

Question 23

Thandi signs an agreement to pay R20 000 fifteen months from now The simple discount rate is 12,5% per annum The discounted amount she receives now equals

[1] R23 703,70

[2] R23 125,00

[3] R17 297,30

[4] R16 875,00

[5] none of the above

ROUGH WORK

Question 24

Mmapule takes out a five-year loan to buy a truck The loan is financed at 13% interest per year compounded monthly, and her monthly payments are R3 412 96 She also adds R25 000 for a deposit The price of the truck, rounded to the nearest rand, is

[1] R175 000,00

[2] R286 328,00

[3] R229 778,00

[4] R197 721,00

[5] R179 778,00

Question 25

A businessman wants to invest the same sum of money at the end of each quarter for five years The investment will earn 8,5% interest per year, compounded quarterly In order to have accumulated a total of R30 000 at the end of five years, the required quarterly investments will be

[1] R1 401,72

[2] R2 518,55

[3] R1 856,91

[4] R1 219,41

[5] none of the above

Question 26

Sam invested R6 800 at 12% interest per year, compounded monthly The number of months he has to wait for this sum to grow up to R9 165,37, rounded to integers, is

[1] 30

[2] 32

[3] 29

[4] 35

[5] none of the above

ROUGH WORK

Questions 27, 28, 29 and 30 are based on the following information:
The incomes (in rand) of eleven taxi drivers during the week are

1 080, 2 000, 1 580, 1 540, 2 500, 1 800, 1 580, 3 000, 3 280, 2 930, 3 120

Question 27

The average income is

[1] 2 219,09
[2] 2 200,00
[3] 1 080,00
[4] 2 441,00
[5] none of the above

Question 28

The mode of the incomes is

[1] 1 080
[2] 2 441
[3] 3 280
[4] 1 580
[5] none of the above

Question 29

The standard deviation of the incomes is

[1] 796,48
[2] 770,10
[3] 25,92
[4] 671,74
[5] none of the above

Question 30

The quartile deviation of the incomes is

[1] 2 000
[2] 1 500
[3] 710
[4] 1 420
[5] none of the above

TOTAL. 100

FORMULAS

$I = PRT$

$S = P(1 + RT)$

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

$P = S(1 - dT)$

$P = S - D$

$D = Sdt$

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

$P = \dfrac{S}{(1 + R)^I}$

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

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

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

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

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

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

${}_mP_r = \dfrac{m!}{(m - r)!}$

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

$y = ax + b$

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

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

$y = ax^2 + bx + c$

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

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

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

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

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

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

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

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

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

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

${}_mC_r = \dfrac{m!}{(m - r)!r!}$

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

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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