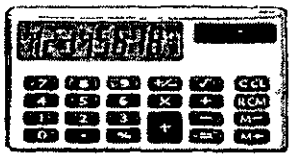
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

QMI1500 (471390) October/November 2017

Elementary Quantitative Methods
Department of Decision Sciences

Duration 2 Hours 100 Marks

EXAMINERS .
FIRST MR P MACHAKA
SECOND DR JE SINGLETON

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 20 pages, including a list of formulas (p 20) and nine sheets of paper for rough work, plus 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. Then, 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

Solve

$$2\left(\frac{x-1}{4}\right)-\frac{2x}{3}=\frac{4-3x}{12}$$

[1] $x = 8$

[2] $x = 12$

[3] $x = 10$

[4] $x = 5$

Questions 2 and 3 are based on the following information:

An investor has decided to purchase shares in the stock of three companies: one engaged in aerospace activities, one involved in energy development, and one involved in electronics. After some research, the account executive of a brokerage firm recommends that the investor considers stock from five aerospace companies, three energy companies, and four electronics companies.

Question 2

In how many ways can the investor select the group of three companies from the account executive's list?

[1] 6 ways

[2] 24 ways

[3] 60 ways

[4] 120 ways

Question 3

Suppose the investor decides to purchase shares in the stock of two aerospace companies, two energy development companies, and two electronics companies. In how many ways can the investor select the group of six companies for the investment from the recommended list of five aerospace companies, three energy companies, and four electronics companies?

[1] 120 ways

[2] 180 ways

[3] 240 ways

[4] 360 ways

Questions 4 and 5 are based on the following information.

Thabo's biology notebook is 30 cm long and 20 cm wide. The dimensions of his desk are in a similar proportion as those of his notebook.

Question 4

If the desk is 90 cm wide, calculate the area of the top of the desk.

[1] 1 215 m^2

[2] 0 18 m^2

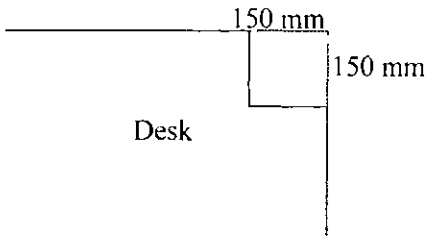
[3] 1 62 m^2

[4] 0 27 m^2

ROUGH WORK

Question 5

Thabo covers each corner of his desk with a square of cardboard, as shown in the diagram below Calculate the new perimeter of the visible part of the top of his desk



[1] 390 cm

[2] 414 8 cm

[3] 450 cm

[4] 420 cm

Question 6

Thabiso and Mariete run a company that manufactures two types of gifts type one and type two To manufacture a type one gift requires two minutes on machine A and one minute on machine B A type two gift requires one minute on machine A and three minutes on machine B There are three hours available on machine A and five hours available on machine B Let x be number of type one gifts and y be the number of type two gifts that can be manufactured Which one of the following systems of linear inequalities represents the above constraints?

[1] $2x + y \leq 180,\ x + 3y \leq 300,\ x \geq 0$ and $y \geq 0$

[2] $2x + y \leq 300\ \ 3x + y \leq 180,\ x \geq 0$ and $y \geq 0$

[3] $x + 2y \leq 180,\ x + 3y \leq 300,\ x \geq 0$ and $y \geq 0$

[4] $x + 2y \leq 300,\ 3x + y \leq 180,\ x \geq 0$ and $y \geq 0$

Question 7

Evaluate

$$\sum_{k=2}^{9} \frac{k(k+1)}{2}$$

[1] 165

[2] 167

[3] 166

[4] 164

ROUGH WORK

Question 8

Simplify

$$\frac{\sqrt[3]{-16x^3y^4}}{\sqrt[3]{128y^2}}$$

[1] $-\dfrac{\sqrt[3]{y^2}}{2x}$

[2] $-\dfrac{x\sqrt[3]{y^2}}{2}$

[3] $-\dfrac{2}{x\sqrt[3]{y^2}}$

[4] $-\dfrac{x}{2\sqrt[3]{y^2}}$

Question 9

Solve the following equations

$$\begin{aligned} x \ + 2y &= 10 \\ 2x + y \ &= 14 \end{aligned}$$

[1] $x = 10,\ y = 14$

[2] $x = 3,\ y = 1$

[3] $x = 5,\ y = 14$

[4] $x = 6,\ y = 2$

Question 10

A mixture contains two parts of substance A for every five parts of substance B If the total weight of the mixture is 50 kg, determine how much of substance B is in the mixture (correct to two decimal places)

[1] 35 71 kg

[2] 20 00 kg

[3] 14 29 kg

[4] 30 00 kg

ROUGH WORK

Questions 11 and 12 are based on the following information:
Fruit prices and amounts consumed for 2012 and 2017 are given in the table below Use 2012 as the base year

	2012		2017	
Items	**Price (R)**	**Quantity**	**Price (R)**	**Quantity**
Bananas (kg)	7 99	100	9 99	120
Grapefruit (each)	3 99	50	4 99	55
Apples (bag)	14 99	85	19 99	85
Strawberries (pack)	9 99	8	15 99	10
Oranges (bag)	13 99	6	19 99	8

Question 11

Determine the Laspeyres price index

[1] 141 39

[2] 109 29

[3] 117 87

[4] 131 15

Question 12

Determine the Paasche quantity index

[1] 141 39

[2] 109 29

[3] 117 87

[4] 131 15

ROUGH WORK

Questions 13 to 15 are based on the following information:
South African law stipulates that if a loaf of bread is not labelled it must weigh 800 g, with a leeway of five percent under and ten percent over Spikiri wants to know whether private bakeries adhere to this standard Spikiri visits a local bakery and records the masses of ten loaves of bread (in grams) in one week He records his results in the table below

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
802 4	787 4	815 7	807 4	801 5	786 6	799 0
796 8	798 8	809 7	798 7	818 3	789 1	806 0
802 5	793 6	785 4	809 3	787 7	801 5	799 4
819 6	812 6	809 1	791 1	805 3	817 8	801 0
801 2	795 9	795 2	820 4	806 6	819 5	796 7
789 0	796 3	787 9	799 8	789 5	802 1	802 2
789 0	797 7	776 7	790 7	803 2	801 2	807 3
808 8	780 4	812 6	801 8	784 7	792 2	809 8
802 4	790 8	792 4	789 2	815 6	799 4	791 2
796 2	817 6	799 1	826 0	807 9	806 7	780 2

Question 13

Determine the mean mass of the loaves for Thursday

[1] 801 61 g
[2] 803 44 g
[3] 798 38 g
[4] 797 16 g

Question 14

Determine the median of the masses of loaves for Tuesday

[1] 800 20 g
[2] 796 15 g
[3] 800 80 g
[4] 796 10 g

Question 15

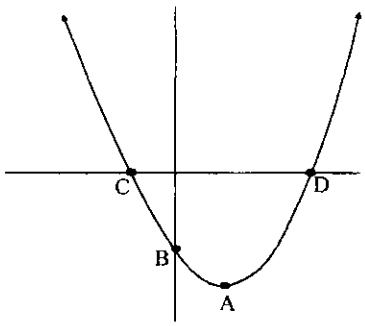
Determine the standard deviation of the masses of loaves for Sunday, given that the mean mass for Sunday is 799 28 g

[1] 10 97 g
[2] 8 61 g
[3] 12 48 g
[4] 9 08 g

ROUGH WORK

Questions 16 and 17 are based on the following function and its graph.

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



Question 16

Determine the coordinates of point A

[1] $A(1, -4)$
[2] $A(4, -5)$
[3] $A(2, -3)$
[4] $A(5, -12)$

Question 17

Determine the coordinates of points C and D

[1] $C(-1, 0)$ and $D(4, 0)$
[2] $C(-3, 0)$ and $D(1, 0)$
[3] $C(-1, 0)$ and $D(3, 0)$
[4] $C(-2, 0)$ and $D(2, 0)$

Question 18

A company's total profit (in rands) from producing and selling x units of its product is given by

$$P(x) = -0\,02x^2 + 300x - 200\,000$$

How many units of this product must the company produce in order to maximise its profits?

[1] 7 500 units
[2] 30 000 units
[3] 5 000 units
[4] 15 000 units

ROUGH WORK

Questions 19 and 20 are based on the following information.
The average cost function (in rands) for a product is given by

$$\bar{C}(x) = \frac{1}{4}x + 4 + \frac{100}{x}$$

where x represents the number of units produced

Question 19

How many production units will result in a minimum average cost per unit?

[1] 15 units
[2] 20 units
[3] 5 units
[4] 25 units

Question 20

Choose the statement that gives a practical interpretation of

$$\bar{C}(25) = 14\,25$$

[1] The marginal cost of producing 25 units is R14 25
[2] The average cost of producing 25 units is R14 25
[3] The total cost of producing 25 units is R14 25
[4] The fixed cost of producing 25 units is R14 25

Question 21

Thembeka was awarded damages of R1 500 000 in a successful lawsuit brought against her employer five years ago Simple interest on judgement accrues at the rate of 12% per year from date of filing If the case were settled today, how much would Thembeka receive in the final judgement?

[1] R2 220 000
[2] R2 250 000
[3] R2 400 000
[4] R2 580 000

Question 22

A family of four spends R6 000 per month on food If inflation occurs at a rate of 5% per year, compounded annually, over the next six years, how much should the typical family of four expect to spend on food six years from now?

[1] R8 040 57
[2] R6 300
[3] R12 282 60
[4] R7 800

ROUGH WORK

Question 23

Marietjie's parents received a large inheritance They wish to set up a trust for her college education They estimate that seven years from now they will need R700 000 How much should they put in trust now if they invest the money at 12% per year compounded quarterly?

[1] R1 547 476 99

[2] R316 644 45

[3] R1 601 549 37

[4] R305 953 73

Question 24

The present value of R200 000 due in three years' time is R139 784 99 What is the annual interest rate if it is compounded monthly?

[1] 12 00%

[2] 14 36%

[3] 12 68%

[4] 14 00%

Question 25

Jaco makes a down payment of R40 000 on a bakkie Thereafter he pays R4 000 per month for 36 months at an interest rate of 12% per year, compounded monthly, on the balance What was the original cost of the bakkie?

[1] R144 000 00

[2] R206 030 70

[3] R160 430 02

[4] R195 840 00

Question 26

Sphelele opens an investment account that earns 9% interest per year, compounded annually He deposits R20 000 into the account on 31 January each year How much will he have in the account after the 25th payment?

[1] R1 694 017 92

[2] R1 866 479 54

[3] R1 625 000 00

[4] R1 535 796 26

ROUGH WORK

Question 27

The Dlamini's have determined that after making a down payment, they could afford to pay a monthly mortgage payment of R20 000. The bank charges an interest rate of 7.2% per year, compounded monthly. If the home loan is to be amortised in equal monthly instalments over 30 years, what is the maximum amount that the Dlamini's can borrow from the bank?

[1] R2 946 427.14

[2] R2 115 375.74

[3] R2 070 197.92

[4] R2 432 750.10

Question 28

A 42-month loan to pay off your car has monthly payments of R4 113.50. If the interest rate is 8.1% per year, compounded monthly, find the unpaid balance immediately after the 24th payment.

[1] R90 860.10

[2] R38 285.30

[3] R42 951.20

[4] R69 501.30

Questions 29 and 30 are based on the following information:
A man buys a house for R2 000 000. He makes a R500 000 down payment and agrees to amortise the rest of the debt with quarterly payments over the next ten years. Interest is charged at 12% per year compounded quarterly.

Question 29

What is the size of the quarterly payments?

[1] R65 338.42

[2] R64 567.92

[3] R64 893.57

[4] R66 369.06

Question 30

What is the total amount of interest paid?

[1] R1 095 742.80

[2] R1 113 536.80

[3] R1 154 762.40

[4] R1 082 476.80

ROUGH WORK

FORMULAS

$I = PRT$

$S = P(1 + RT)$

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

$P = S(1 - dT)$

$P = S - D$

$D = Sdt$

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

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

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

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

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

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

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

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

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

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

$y = ax + b$

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

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

$y = ax^2 + bx + c$

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

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

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

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

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

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

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

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

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

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

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

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

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EXAMINATION MARK READING SHEET EKSAMEN-MERKLEESBLAD

PART 1 (GENERAL/ALGEMEEN) DEEL 1

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

2 PAPER NUMBER
VRAESTELNOMMER

3 INITIALS AND SURNAME
VOORLETTERS EN VAN

4 DATE OF EXAMINATION
DATUM VAN EKSAMEN

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

6 STUDENT NUMBER
STUDENTENOMMER

7 c0 c1 c2 c3 c4 c5 c6 c7 c8 c9

8 UNIQUE PAPER NO
UNIEKE VRAESTEL NR

9 c0 c1 c2 c3 c4 c5 c6 c7 c8 c9

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
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9	c1 c2 c3 c4 c5	44	c1 c2 c3 c4 c5	79	c1 c2 c3 c4 c5	114	c1 c2 c3 c4 c5
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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
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21	c1 c2 c3 c4 c5	56	c1 c2 c3 c4 c5	91	c1 c2 c3 c4 c5	126	c1 c2 c3 c4 c5
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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
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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