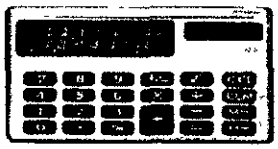
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

QMI1500 (497368) May/June 2015

DEPARTMENT OF DECISION SCIENCES
ELEMENTARY QUANTITATIVE METHODS

Duration 2 Hours 100 Marks

EXAMINERS
FIRST MR MJ RANGOAGA
SECOND PROF G DAVIE

Programmable pocket calculator is permissible

Closed book examination.

This paper consists of 19 pages.

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 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. Then, if you have entered your student number incorrectly, we shall still be able to link you to the mark-reading sheet.

Question 1

Determine the value of

$$4\frac{5}{8} - 3\frac{1}{4} + 1\frac{1}{5}$$

The correct answer is

[1] $1\frac{9}{17}$
[2] $1\frac{19}{20}$
[3] $2\frac{23}{40}$
[4] $13\frac{3}{13}$
[5] none of the above

Question 2

Simplify

$$\frac{3^2 \times 5^5 + 3^3 \times 5^3}{3^4 \times 5^4}$$

The correct answer is

[1] $1\frac{9}{48}$
[2] $\frac{28}{45}$
[3] 277
[4] 1 875
[5] none of the above

Question 3

Simplify

$$\frac{1}{3} - \left(\frac{2}{5} + \frac{1}{4}\right) - \left(\frac{3}{8} \times \frac{1}{3}\right)$$

The correct answer is

[1] $-\frac{7}{3}$
[2] $-5\frac{4}{15}$
[3] $-3\frac{4}{15}$
[4] $-4\frac{13}{15}$
[5] none of the above

Question 4

At a conference $\frac{3}{5}$ of the men have beards and $\frac{2}{3}$ of the women have long hair. There are 120 delegates at the conference and 46 do not fall into the above groups. How many men and women are at the conference? The correct answer is

[1] there are 72 men and 48 women

[2] there are 90 men and 30 women

[3] there are 80 men and 40 women

[4] there are 74 men and 46 women

[5] none of the above

Question 5

The expression

$$\frac{\left(\frac{4}{3}\right)^3 \times \left(\frac{3}{5}\right)^{-2}}{\left(\frac{2}{5}\right)^{-3}}$$

can be rewritten as

[1] $\frac{12}{9} \times \frac{10}{6} \times \frac{15}{6}$

[2] $\frac{64}{27} \times \frac{9}{25} \times \frac{8}{125}$

[3] $\frac{12}{9} \times \frac{25}{9} \times \frac{8}{125}$

[4] $\frac{64}{27} \times \frac{25}{9} \times \frac{8}{125}$

[5] none of the above

Question 6

The expression

$$x_1^2 f(x_1) + x_2^2 f(x_2) + x_3^2 f(x_3) + x_4^2 f(x_1) + x_5^2 f(x_5)$$

can be written in summation notation as

[1] $\sum_{i=1}^{5} x_5^2 f(x_5)$

[2] $\sum_{i=1}^{5} x_1^2 f(x_5)$

[3] $\sum_{i=1}^{5} x_i^2 f(x_i)$

[4] $\sum_{i=1}^{5} x^2 f(x)$

[5] none of the above

Question 7

It takes 50 minutes to manufacture a certain product Using a new type of tool the time can be reduced by 15% The new time taken is

[1] 45 minutes

[2] 7 5 minutes

[3] 20 minutes

[4] 42.5 minutes

[5] none of the above

Question 8

A piece of timber is 273 cm long and it is cut into three pieces namely A B and C in the ratio of 3 7 11 respectively Determine the length of the three pieces The correct answer is

[1] A = 143cm B = 91cm and C = 39cm

[2] A = 39cm, B = 91cm and C = 143cm

[3] A = 91cm B = 39cm and C = 143cm

[4] A = 13cm, B = 91cm and C = 169cm

[5] none of the above

Question 9

The area of a rectangle is 23,6 cm^2 and its width is 3 10 cm shorter than the length Determine the width of the rectangle, to three decimal places The correct answer is

[1] 9,749 cm

[2] 6 649 cm

[3] 7,613 cm

[4] 3 549 cm

[5] none of the above

Question 10

Assume that in a data set of 50 observations the largest value is 180 and the smallest value is 68 If there are 8 classes, the width of the class intervals is

[1] 14

[2] 16

[3] 18

[4] 8

[5] none of the above

Question 11

In a manufacturing plant a packaging machine is supposed to fill small bags of marbles with exactly 50 marbles per bag. A random sample of four bags indicates that one bag has 52 marbles, another has 45, two have 47 marbles. What is the **mode** of these bags?

[1] 45

[2] 50

[3] 52

[4] 47

[5] None of the above

Question 12

Consider the following table
Match each case in Column A with an appropriate description in Column B

A **Measures of central tendency and dispersion**	**B** **Descriptions**
1 Standard deviation	A Compares two or more sets of data with means sample sizes or measurements units
2 Mean	B The value that occurs most often in a data set
3 Mode	C Measures how the data differ from the mean
4 Coefficient of variation	D Reliable since it reflects all the values in a data set

The correct matches are

[1]
1 matches with A
2 matches with C
3 matches with B
4 matches with D

[2]
1 matches with C
2 matches with A
3 matches with B
4 matches with D

[3]
1 matches with C
2 matches with D
3 matches with B
4 matches with A

[4]
1 matches with D
2 matches with B
3 matches with C
4 matches with A

[5] None of the above

Questions 13 and 14 are based on the following information
The life-time of 18 twelve-volt cells in hours is given in the following data

65	*75*	*71*	*68*	*65*	*72*
69	*65*	*61*	*73*	*70*	*63*
66	*67*	*74*	*64*	*60*	*62*

Question 13

Calculate the **median** of the cells life-time The correct answer to two decimal places is

[1] 67 22

[2] 66 50

[3] 15 00

[4] 65 00

[5] none of the above

Question 14

You are given the following intervals

60 5 – 63 5
63 5 – 66 5
66,5 – 69,5
69 5 – 72 5
72,5 – 75 5

The correct frequency table for the data is

[1]

Interval	Frequency	Tally
60 5 – 63 5	5	
63 5 – 66 5	4	
66 5 – 69 5	3	
69 5 – 72 5	3	
72 5 – 75 5	3	

[2]

Interval	Tally	Frequency
60,5 – 63 5	4	
63 5 – 66 5	5	
66 5 – 69 5	3	
69 5 – 72 5	3	
72 5 – 75 5	3	

[3]

Interval	Tally	Frequency
60 5 - 63 5	5	
63 5 – 66 5	4	
66 5 – 69,5	3	
69 5 72 5	3	
72 5 – 75 5	3	

[4]

Interval	Tally	Frequency
60 5 – 63,5	5	
63,5 – 66 5	3	
66 5 69 5	4	
69 5 – 72 5	3	
72,5 – 75 5	3	

[5] none of the above

Question 15

Identify the correct type of data for the following variables

time interval
type of food
number of defective items
The correct type of data for the variables is

[1]

Variable	Type of data
time interval	continuous quantitative
type of food	qualitative
number of defective items	discrete quantitative

[2]

Variable	Type of data
time interval	continuous qualitative
type of food	quantitative
number of defective items	discrete qualitative

[3]

Variable	Type of data
time interval	continuous quantitative
type of food	quantitative
number of defective items	discrete qualitative

[4]

Variable	Type of data
time interval	continuous quantitative
type of food	discrete quantitative
number of defective items	continuous qualitative

[5] none of the above

Question 16

Consider the quadratic function

$$y = x^2 - 7x + 10$$

The value of $\sqrt{b^2 - 4ac}$ to two decimal places is

[1] 9.00

[2] −2.25

[3] 3.00

[4] −1.00

[5] none of the above

Question 17

What is the present value of R12 000 due in exactly eight years from now, if the interest rate is 7% per annum compounded quarterly?

[1] R10 444 94

[2] R10 526 32

[3] R20 906.56

[4] R6 887 79

[5] None of the above

Question 18

Mel has two part-time jobs One week he earned R1 053 10 by working on lawns for 10 hours and making deliveries for seven hours The previous week he earned R1 000 65 by working on lawns for nine hours and making deliveries for eight hours Let r be the amount of money earned on lawns and y be the amount earned on making deliveries The simultaneous linear equations suitable for this problem are

[1]
$$\begin{aligned} 10r + 7y &= 1\,053\,10 \quad (1) \\ 9x + 8y &= 1\,000{,}65 \quad (2) \end{aligned}$$

[2]
$$\begin{aligned} 10r + 9y &= 1\,053\,10 \quad (1) \\ 7x + 8y &= 1\,000{,}65 \quad (2) \end{aligned}$$

[3]
$$\begin{aligned} 10x + 8y &= 1\,053\,10 \quad (1) \\ 9r + 7y &= 1\,000{,}65 \quad (2) \end{aligned}$$

[4]
$$\begin{aligned} 10r + 7y &= 1\,000{,}65 \quad (1) \\ 9x + 8y &= 1\,053\,10 \quad (2) \end{aligned}$$

[5] none of the above

Question 19

When solving the inequality

$$-5x + 3 \geq x - 15$$

the solution to one decimal place is

[1] $r \geq 2{,}0$

[2] $r \leq 4\,5$

[3] $x \leq 3{,}0$

[4] $x \geq 5\,0$

[5] none of the above

Question 20

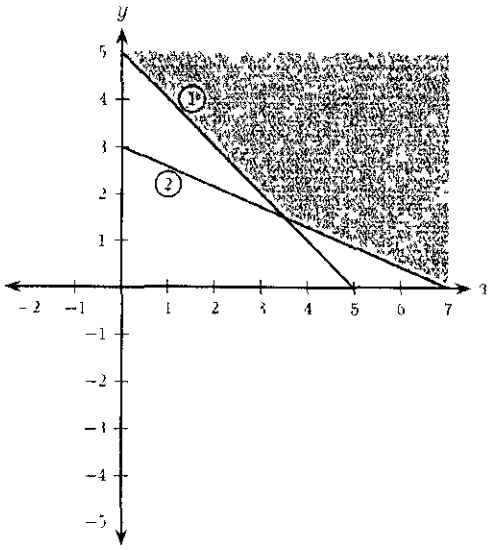
The correct graph that represents the inequalities

$$3x + 3y \geq 15 \quad (1)$$

$$9x + 21y > 63 \quad (2),$$

is

[1]



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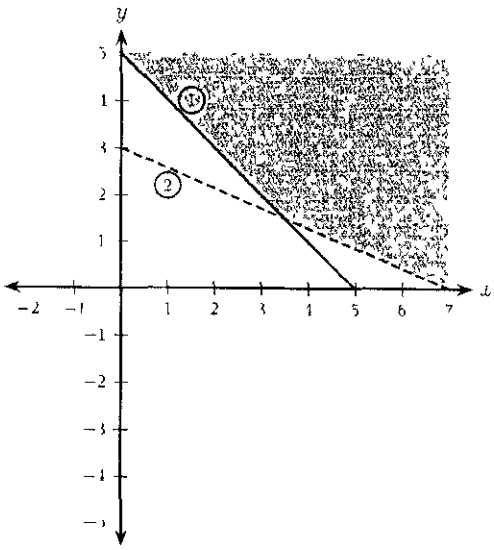

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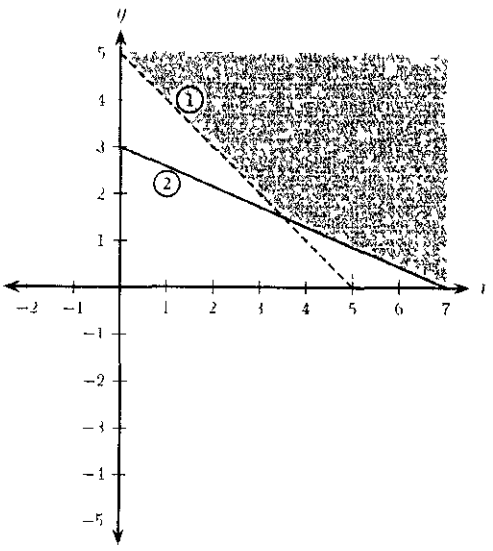

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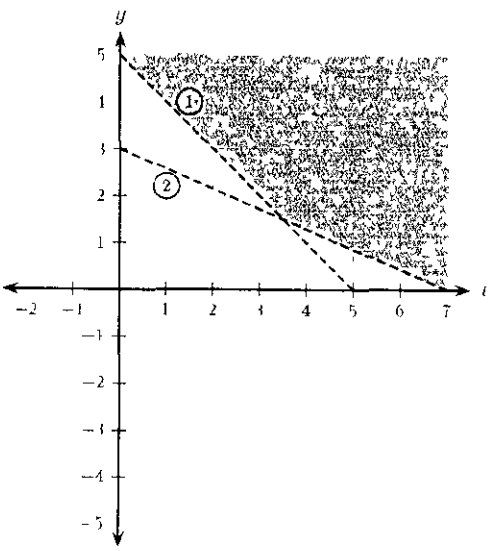


[5] none of the above

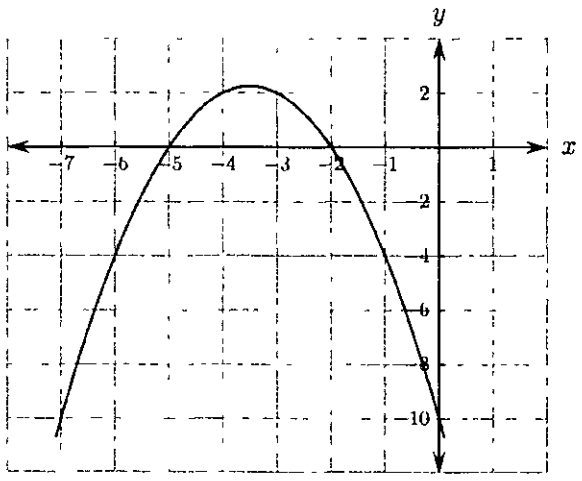
Question 21

The correct graphical representation of the quadratic function

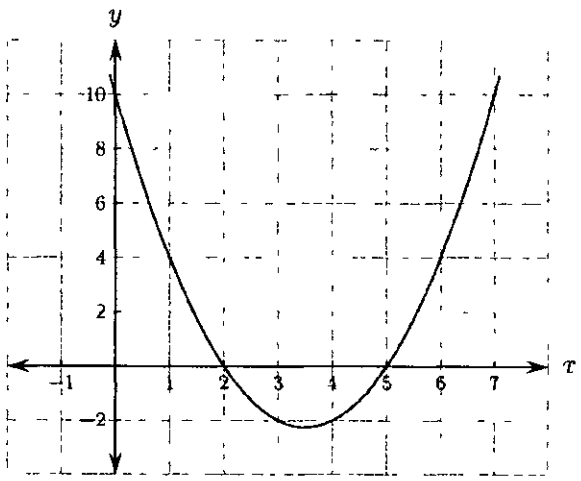
$$y = x^2 - 7x + 10$$

is

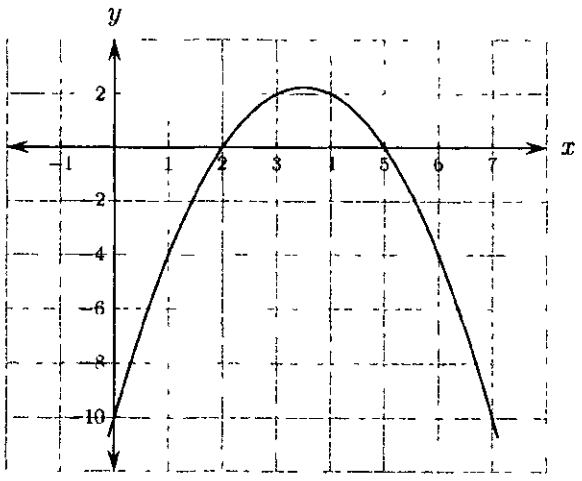
[1]



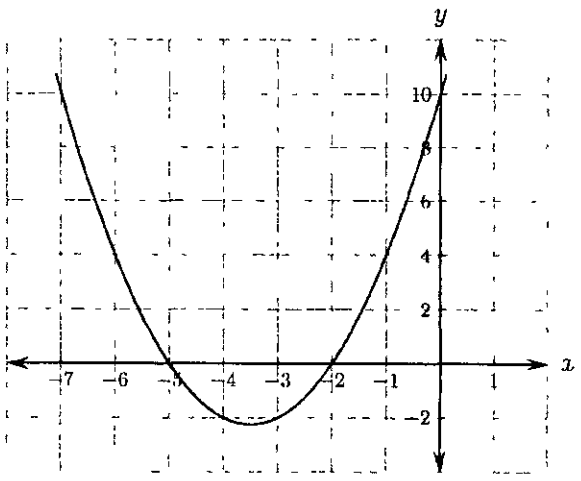
[2]



[3]



[4]

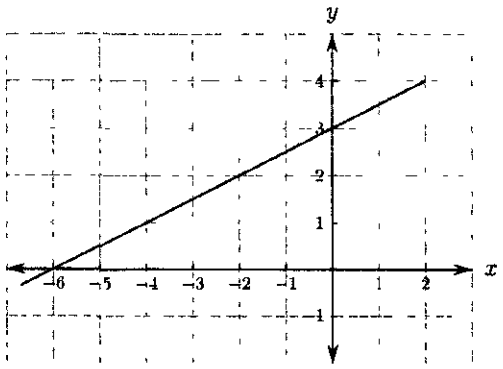


[5] none of the above

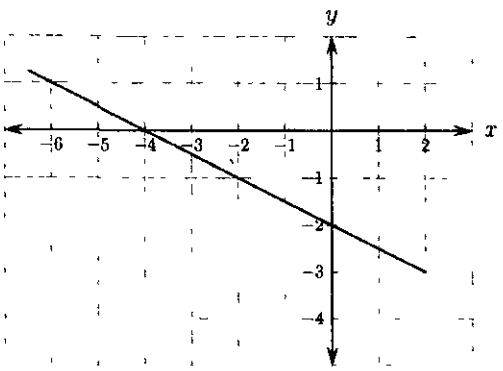
Question 22

The graph that shows a line with a slope of $-\frac{1}{2}$, is

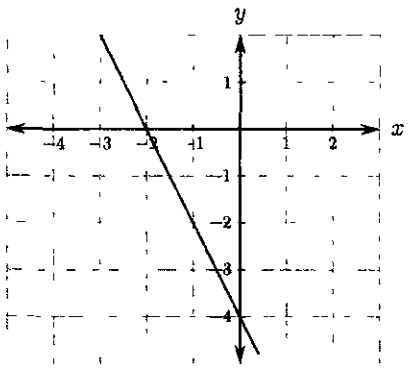
[1]



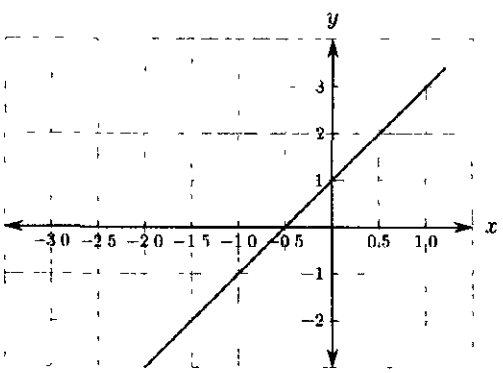
[2]



[3]



[4]



[5] none of the above.

Question 23

What is the sum accumulated in 6 years' time of R2 000 invested now, R4 000 invested at the end of 3 years from now and R5 000 invested 5 years from now, if the interest rate is 5% per annum compounded monthly?

[1] R11 121,57

[2] R12 599,73

[3] R13 062,68

[4] R14 839,20

[5] None of the above

Question 24

Stanley borrows R25 000 at an interest rate of 14% per year compounded monthly The loan is amortised in five equal payments at the end of each month Calculate the payments The correct answer is

[1] R5 176 35

[2] R5 000 00

[3] R4 884 69

[4] R7 282 09

[5] none of the above

Question 25

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

[5] none of the above

Question 26

If

$$f(x) = x - x^{-2} - \frac{2}{3}x^3 - 9x^4,$$

then $f'(x)$ is equal to

[1] $1 - 2x^{-3} - 2x^2 - 36x^3$

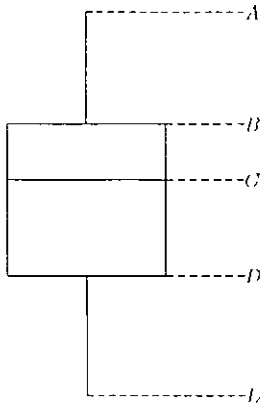
[2] $1 + 2x^{-1} - 2x^2 - 36x^3$

[3] $1 + 2x^{-3} - \frac{2}{3}x^2 - 36x^3$

[4] $1 + 2x^{-3} - 2x^2 - 36x^3$

[5] none of the above

Questions 27 and 28 are based on the following information
Consider the box-and-whiskers diagram given below



where $A = 75$, $B = 55$ $C = 45$, $D = 35$ *and* $E = 20$

Question 27

Without making any calculations determine the quartile deviation for the data The correct answer is

[1] 55
[2] 50
[3] 45
[4] 35
[5] none of the above

Question 28

The range for the data is

[1] 55
[2] 50
[3] 45
[4] 35
[5] none of the above

Questions 29 and 30 are based on the following information.
The table below shows the prices and quantities of the major raw materials used in a factory in 2012 and 2014

Material	2012		2014	
	Quantity (kilograms)	Price (rand)	Quantity (kilograms)	Price (rand)
X	6 000	19 00	5 000	21 50
Y	3 000	32 00	5 000	35,00
Z	9 000	6.00	11 000	7,50

Question 29

Determine

$$\sum p_{2012} \times q_{2011} \quad \text{and} \quad \sum p_{2014} \times q_{2014}$$

The correct answer is

[1] $\sum p_{2012} \times q_{2014} = 365\,000\,00$ and $\sum p_{2014} \times q_{2014} = 321\,000\,00$

[2] $\sum p_{2012} \times q_{2014} = 1\,573\,50$ and $\sum p_{2014} \times q_{2014} = 21\,000{,}00$

[3] $\sum p_{2012} \times q_{2014} = 321\,000{,}00$ and $\sum p_{2014} \times q_{2011} = 365\,000{,}00$

[4] $\sum p_{2012} \times q_{2014} = 21\,057\,00$ and $\sum p_{2014} \times q_{2014} = 21\,064{,}00$

[5] none of the above

Question 30

The Value index for 2014 with 2012 as base year to two decimal places is

[1] 87.95

[2] 121 59

[3] 114 20

[4] 138.26

[5] none of the above

FORMULAE

$I = PRT$

$S = P(1 + RT)$

$P = S(1 - dT)$

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

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

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

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

$P_L(n) = \frac{\sum p_n q_o}{\sum p_o q_o} \times 100$

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

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

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

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

$P = S - D$

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

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

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

$y = ax + b$

$y = ax^2 + bx + c$

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

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

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

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

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

$Q_L(n) = \frac{\sum p_o q_n}{\sum p_o q_o} \times 100$

$V = \frac{\sum p_n q_n}{\sum p_o q_o} \times 100$

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

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

$D = Sdt$

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

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

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

ROUGH WORK

ROUGH WORK

ROUGH WORK

ROUGH WORK

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

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			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