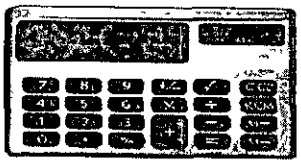
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

QMI1500 (494835) October/November 2015

DEPARTMENT OF DECISION SCIENCES
ELEMENTARY QUANTITATIVE METHODS

Duration 2 Hours 100 Marks

EXAMINATION PANEL AS APPOINTED BY THE DEPARTMENT

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 25 pages, including a list of formulas (p 25) 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

Marisa's car operates at the ratio of kilometres travelled per litre of petrol

$$50 \quad 4$$

She plans to drive 300 kilometres today and 380 kilometres tomorrow The number of litres of petrol she should expect to use in total, rounded to two decimal places, is

[1] 170,00
[2] 54,40
[3] 13,60
[4] 24,00
[5] none of the above

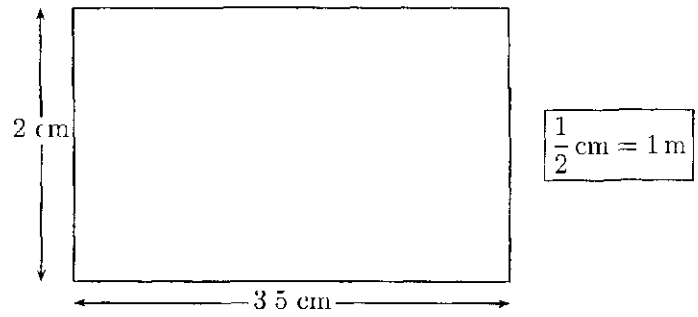
Question 2

Mr Singh sells his house for R585 000 The total commission is 6,5% of the selling price of which the broker receives three-quarters and the salesperson receives the rest The amount that the salesperson receives is

[1] R9 506,25
[2] R28 518,75
[3] R95 062,50
[4] R38 025,00
[5] none of the above

Question 3

Mr Craig makes a scale drawing of his office The enlarged representation is shown below



The area of his office in square metres is

[1] $28\,m^2$
[2] $7\,m^2$
[3] $22\,m^2$
[4] $14\,m^2$
[5] none of the above

ROUGH WORK

Question 4

The expression

$$24 - 4 \times 2 + 6 + 2 \times \left(4 + 2^3 - 4 - 1\right)$$

can be rewritten as

[1] $12 + 6 + 2 \times 5$

[2] $12 + 6 + 2 \times 2$

[3] $3 + 6 + 2 \times 5$

[4] $12 + 8 \times 4$

[5] none of the above

Question 5

Simplifying

$$\frac{3}{4} + 1\frac{9}{12} \times 2\frac{1}{7}$$

gives

[1] $4\frac{9}{14}$

[2] $5\frac{5}{14}$

[3] $4\frac{1}{2}$

[4] $2\frac{6}{7}$

[5] none of the above

Question 6

The solution of

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

is

[1] $x = 4$

[2] $x = \frac{4}{5}$

[3] $x = -\frac{2}{3}$

[4] $x = 1\frac{1}{3}$

[5] none of the above

ROUGH WORK

Question 7

When solving the system of linear equations

$$a = 4b$$
$$a - b = 9$$

the solution is

[1] $a = 7\frac{1}{5}$ and $b = 1\frac{4}{5}$

[2] $a = 12$ and $b = 3$

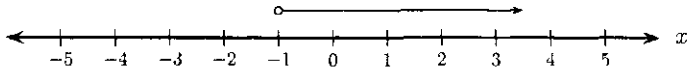
[3] $a = -20$ and $b = -5$

[4] $a = -12$ and $b = -3$

[5] none of the above

Question 8

The inequality that corresponds to the graph



is (x is an integer)

[1] $-x < 1$

[2] $-x > 1$

[3] $x \geq -1$

[4] $-x < -1$

[5] none of the above

Question 9

The graph of the linear function that is parallel to the graph of the linear function $y = \frac{5}{3}x + 4$ is

[1] $y = \frac{5}{3}x + 2$

[2] $y = \frac{3}{5}x + 4$

[3] $y = -\frac{5}{3}x + 2$

[4] $y = 4x + \frac{5}{3}$

[5] none of the above

ROUGH WORK

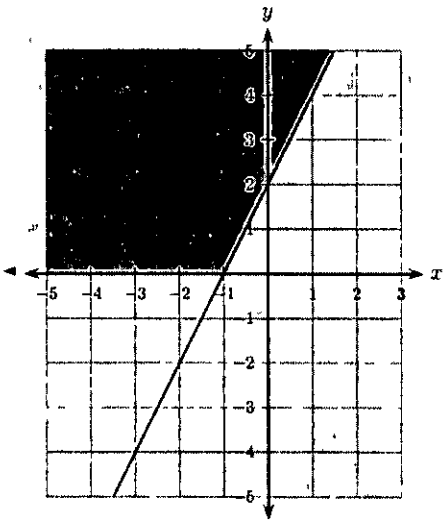
Question 10

The correct graph that represents the inequality

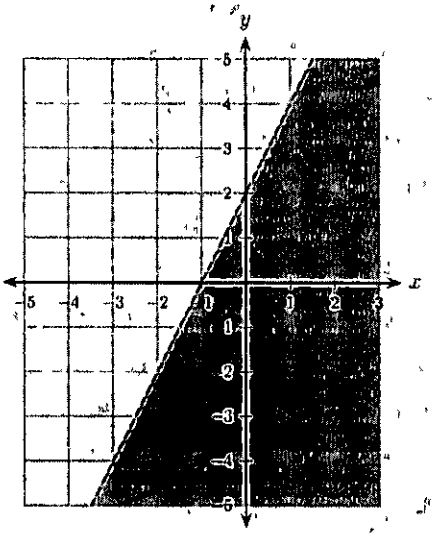
$$3y - 6x \geq 6$$

is

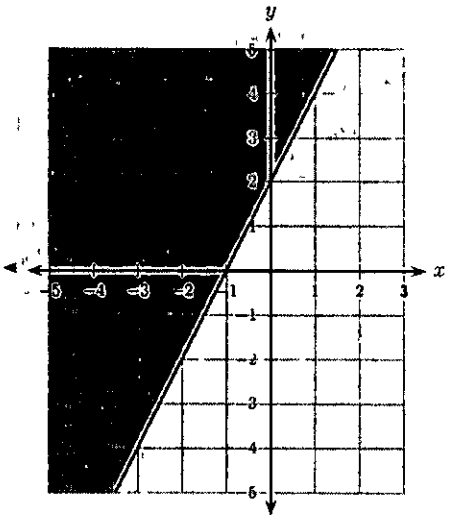
[1]



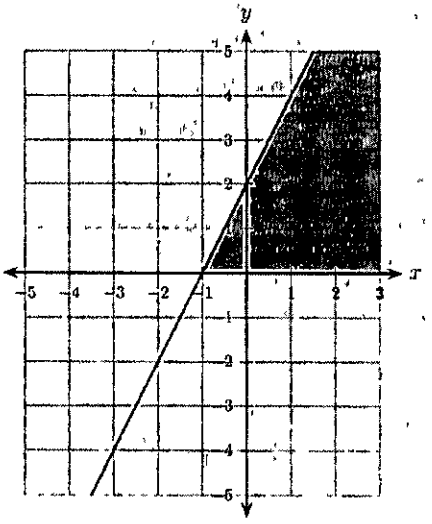
[2]



[3]



[4]

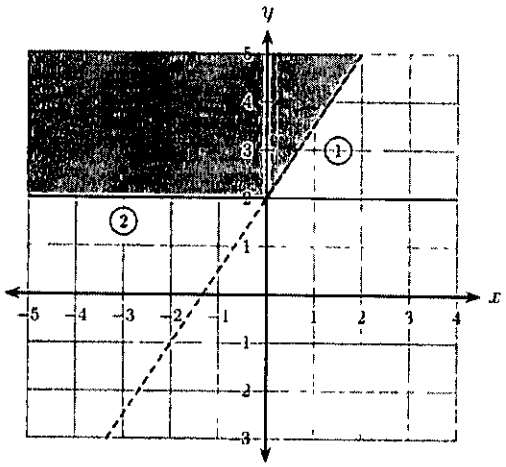


[5] none of the above

ROUGH WORK

Question 11

Consider the following graph



The system of inequalities whose solution space is represented by the shaded region, is

[1]
$$3x - 2y > -4 \quad (1)$$
$$4y \geq 8 \quad (2)$$

[2]
$$3x - 2y < -4 \quad (1)$$
$$4y \geq 8 \quad (2)$$

[3]
$$3x - 2y \leq -4 \quad (1)$$
$$4y > 8 \quad (2)$$

[4]
$$3x - 2y < -4 \quad (1)$$
$$4y < 8 \quad (2)$$

[5] none of the above

Question 12

The vertex of the parabola

$$y = x^2 + 14x + 40$$

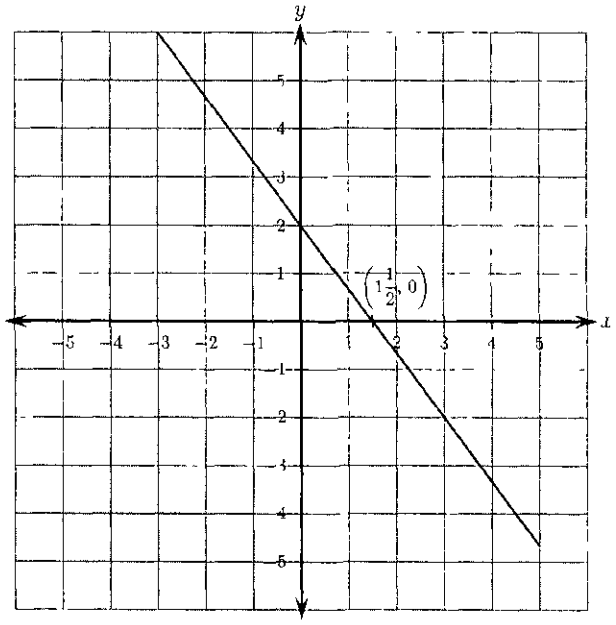
is

[1] $(-10, -4)$
[2] $(-9, -7)$
[3] $(0, 40)$
[4] $(-7, -9)$
[5] none of the above

ROUGH WORK

Question 13

The equation of the straight line that is represented by the graph



is

[1] $y = -\frac{3}{4}x + 1\frac{1}{2}$

[2] $y = -\frac{4}{3}x + 2$

[3] $y = \frac{4}{3}x + 2$

[4] $y = \frac{4}{3}x - 2$

[5] none of the above

Question 14

A company uses the quadratic function

$$y = -4{,}5x^2 + 150x$$

to represent the number of new customers x weeks after the release of its new service. The number of new customers that it can expect 14 weeks after the release is

[1] 1 667

[2] 1 250

[3] 1 218

[4] 3 333

[5] none of the above

ROUGH WORK

Question 15

Consider the quadratic function

$$y = x^2 - 2x - 15$$

Choose the correct statement regarding the discriminant and the intercepts of the graph of the function on the x-axis

The discriminant is

[1] 64 and the graph has two separate intercepts on the x-axis

[2] $\sqrt{64}$ and the graph just touches the x-axis

[3] 0 and the graph has no intercepts on the x-axis

[4] -15 and the graph has only one intercept on the x-axis

[5] none of the above

Question 16

The difference between the compounded interest on R5 000 for one and a half years at an interest rate of 14% per annum, compounded yearly and compounded half-yearly, rounded to the nearest ten cents, is

[1] R85,90

[2] R50,00

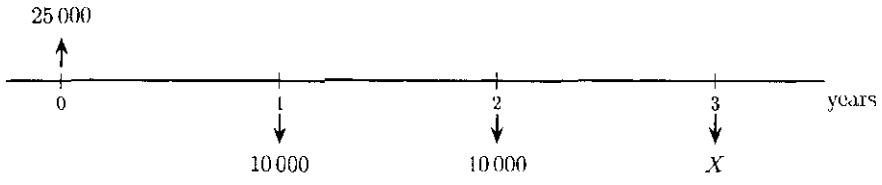
[3] R125 20

[4] R39,30

[5] none of the above

Question 17

You have taken out a loan of R25 000 that requires you to make two equal payments of R10 000 each at the end of the next two years and to pay the outstanding balance at the end of three years. The debt and payments are subjected to the same interest rate, namely 10% per year compounded yearly. This is represented by the following time line with the debt shown above the line and the payments below



@ 10% per year, compounded yearly

The amount that you have to pay at the end of year three in order to settle your debt is indicated by X. The value of X is equal to

[1] R9 500,00

[2] R10 175,00

[3] R5 500,00

[4] R11 275,00

[5] none of the above

ROUGH WORK

Question 18

Mr Gonzalez has created a college investment fund for his daughter He will deposit R850 *at the end of every month* for the next eight years in an account with an 8,5% annual rate of return compounded monthly The amount of money that his daughter will have when she starts college is

[1] R59 060 06

[2] R57 800 00

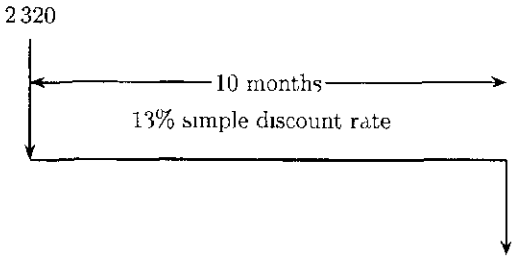
[3] R9 206 04

[4] R116 298,24

[5] none of the above

Question 19

James receives R2 320 when he takes out a discount loan with an annual simple discount rate of 13% The loan has to be repaid in ten months' time This is represented by the following time line



The discount on the loan is

[1] R251,33

[2] R263,95

[3] R281,87

[4] R248,74

[5] none of the above

Question 20

Jason is buying a house for R246 520 He will put down 25% and *finance the rest for 15 years* at an annual interest rate of 9,15% compounded quarterly The size of the *equal payments at the end of each quarter* that he will need to make to pay off the loan is

[1] R7 594,01

[2] R5 695,51

[3] R1 466,15

[4] R1 898,50

[5] none of the above

ROUGH WORK

Question 21

John Doeber borrows R75 202 from his brother to buy a boat The interest rate is 11% per year compounded half-yearly He promises to repay the loan in 12 *equal half-yearly payments* of R8 725,63 each Considering the amortisation schedule, the outstanding principal at the start of the second half year is

[1] R70 612,48

[2] R65 770,54

[3] R3 883,69

[4] R65 770,54

[5] none of the above

Question 22

At a certain point in time the South African rand (R) is converted to the American dollar ($) at a rate of

$$\$1{,}00 = \text{R}6{,}50$$

If an article costs $15 in the USA, the number of articles that can be bought for R2 535 is

[1] 169

[2] 97

[3] 390

[4] 26

[5] none of the above

Question 23

Using the table

	2009		2011	
	Price	Quantity	Price	Quantity
Item 1	160	200	520	500
Item 2	350	650	265	250

the Laspeyres quantity index for 2011 using 2009 as the base year is found by calculating

[1] $\dfrac{(160+350)\times(500+250)}{(160+350)\times(200+650)}\times 100$

[2] $\dfrac{(160\times 500)+(350\times 250)}{(160\times 200)+(350\times 650)}\times 100$

[3] $\dfrac{(520\times 200)+(265\times 650)}{(160\times 200)+(350\times 650)}\times 100$

[4] $\dfrac{(520\times 500)+(265\times 250)}{(520\times 200)+(265\times 650)}\times 100$

[5] none of the above

ROUGH WORK

Question 24

An inspector visits a large company to check its vehicles The company has the following vehicles

5 large-load vehicles, 130 light vans, 25 cars

The inspector decides to take a sample of 20% of all the vehicles Each type of vehicle is to be represented in the sample, so he will use the stratified random sampling technique The number of light vans that should be inspected is

[1] 16

[2] 5

[3] 32

[4] 26

[5] none of the above

Question 25

Consider the following data

66, 84, 75, 60, 72, 55, 68, 67, 52, 63

The correct frequency table with the given intervals is

[1]

Interval	Frequency
49,5 – 59,5	3
59,5 – 69,5	4
69,5 – 79,5	2
79,5 - 89,5	1

[2]

Interval	Frequency
49,5 – 59,5	2
59,5 – 69,5	7
69,5 – 79,5	9
79,5 – 89,5	10

[3]

Interval	Frequency
49,5 – 59,5	2
59,5 – 69,5	4
69,5 – 79,5	3
79,5 – 89,5	1

[4]

Interval	Frequency
49,5 – 59,5	2
59,5 – 69,5	5
69,5 – 79,5	2
79,5 – 89,5	1

[5] none of the above

Question 26

The weekly marginal profit function for producing and selling a certain product is

$$P'(q) = 4\left(3^2 - q\right) + 112$$

where q is the number of products produced and sold To maximise profit, the number of products that have to be produced and sold per week is

[1] 4

[2] 37

[3] 148

[4] 112

[5] none of the above

ROUGH WORK

Questions 27, 28 and 29 are based on the following information.

The number of bicycles sold monthly by a bicycle seller in 2011 is

Month	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Number	*25*	*18*	*30*	*36*	*18*	*20*	*16*	*24*	*33*	*19*	*21*	*45*

Question 27

The median number of bicycles that were sold during 2011, rounded to two decimal places is

[1] 18,00

[2] 6,50

[3] 22,50

[4] 25,42

[5] none of the above

Question 28

The mean number of bicycles that were sold during the *first six months of 2011*, rounded to two decimal places, is

[1] 25,42

[2] 24,50

[3] 18,67

[4] 26,33

[5] none of the above

Question 29

The standard deviation of the number of bicycles that were sold during the *first six months of 2011* is 7,31. The coefficient of variation of the number of bicycles that were sold during the *last six months of 2011* is 0.4116 or 41,16%. Calculate the coefficient of variation of the number of bicycles that were sold during the *first six months of 2011* and choose the correct statement

[1] The sales during the first six months display less variation than the sales during the last six months of 2011

[2] The sales during the first six months display more variation than the sales during the last six months of 2011

[3] No conclusion can be made regarding the variation in the sales between the first and last six months of 2011

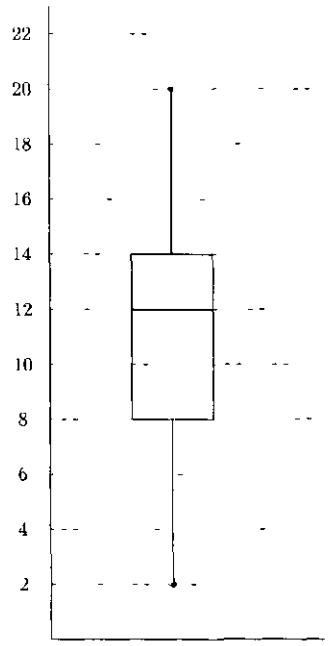
[4] The variation in sales was the same for the first and the last six months of 2011

[5] None of the above

ROUGH WORK

Question 30

The number of e-mails that ten secretaries have sent in one day is shown in the box-and-whiskers diagram below



The number 14 indicated on the box-and-whiskers diagram refers to the

[1] median number of e-mails

[2] maximum number of e-mails

[3] third quartile of the number of e-mails

[4] mean number of e-mails

[5] none of the above

TOTAL 100

EXAMINERS
FIRST: MRS CE ROOS
SECOND. MS J LE ROUX, PROF I BASSON

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 $f(x) = ax^n$, 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

INITIALS AND SURNAME / VOORLETTERS EN VAN — 3

DATE OF EXAMINATION / DATUM VAN EKSAMEN — 4

PAPER NUMBER / VRAESTELNOMMER — 2

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	36	71	106
2	37	72	107
3	38	73	108
4	39	74	109
5	40	75	110
6	41	76	111
7	42	77	112
8	43	78	113
9	44	79	114
10	45	80	115
11	46	81	116
12	47	82	117
13	48	83	118
14	49	84	119
15	50	85	120
16	51	86	121
17	52	87	122
18	53	88	123
19	54	89	124
20	55	90	125
21	56	91	126
22	57	92	127
23	58	93	128
24	59	94	129
25	60	95	130
26	61	96	131
27	62	97	132
28	63	98	133
29	64	99	134
30	65	100	135
31	66	101	136
32	67	102	137
33	68	103	138
34	69	104	139
35	70	105	140