UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

COS1521 (483841) May/June 2015
RCO1521 (478875)

COMPUTER SYSTEMS: FUNDAMENTAL CONCEPTS

Duration 2 Hours 100 Marks

EXAMINERS
FIRST MR S SSEMUGABI
SECOND MR ME BOGOPA

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 30 pages and the instructions for the completion of a mark-reading sheet

Please complete the attendance register on the back page, tear it off and hand it to the invigilator

Instructions:

1 All the questions in this paper are **multiple-choice**
2 There are 80 questions in total Your total mark out of 80 will be converted to a final exam mark out of 100
3 Answer all the questions There is also space for rough work
4 Using a pencil, answer all the questions on the mark-reading sheet
5 Remember to fill in the **unique number** (see top of page) on the mark-reading sheet
6 You are not allowed to use a calculator

EVERYTHING OF THE BEST!

[TURN OVER]

This paper consists of 80 multiple-choice questions.
Each question is worth 1 mark.
Your total out of 80 will be converted to give a final exam mark out of 100.

Mark only one alternative per question with a pencil on the mark-reading sheet.
(Remember to fill in the unique number.)

Section A: Computer background, number systems, data storage, operations on data and logic (27 marks)

QUESTION 1
Which one of the following is NOT TRUE about the von Neumann Model?

1 One instruction may request the control unit to jump to some previous or following instruction
2 A program is made up of an infinite number of executions
3 Instructions are executed one after another
4 Both data and programs should have the same format

QUESTION 2
Historians divide computer software and hardware into generations In which generation did computers start to use integrated circuits (ICs)?

1 Second
2 Third
3 Fourth
4 Fifth

QUESTION 3
Convert $(100111)_2$ to a decimal number

1 $(47)_{10}$
2 $(17)_{10}$
3 $(71)_{10}$
4 $(39)_{10}$

QUESTION 4

Convert $(7C\ 4)_{16}$ to an octal number

1 $(157\ 2)_8$
2 $(174\ 2)_8$
3 $(83\ 4)_8$
4 $(463\ 2)_8$

QUESTION 5

Which one of the following number representations is CORRECT?

1 $(200\ 1)_2$
2 $(12\ 01)_2$
3 $(DF0)_{16}$
4 $(418)_8$

QUESTION 6

What is the 2's complement representation of –25 using 6 bits?

1 $(010011)_2$
2 $(111001)_2$
3 $(100111)_2$
4 $(111001)_2$

Rough work

QUESTION 7
Which one of the following statements regarding sign-and-magnitude representation is NOT TRUE?

1 There are two 0s in sign-and-magnitude representation positive zero and negative zero
2 Sign-and-magnitude representation is often used to quantise an analog signal
3 Sign-and-magnitude representation is commonly used to store integers
4 Sign-and-magnitude numbers are subjected to positive and negative overflow

QUESTION 8
How many parts is a floating point representation of a number made up of?

1 3
2 2
3 1
4 4

QUESTION 9
Which one of the following statements regarding the storing of audio or images is NOT TRUE?

1 A video consists of frames
2 'Pixels' stands for picture elements
3 JPEG (Joint Photographic Expert Group) uses the indexed colour scheme
4 Raster graphics is used when an analog image such as a photograph must be stored

QUESTION 10
If the input is 1110011, and the mask 0001111 is used to set the input, what is the resulting output?

1 0000000
2 1111111
3 0001111
4 0000011

QUESTION 11
Calculate $(10110)_2 + (1101)_2$

1 $(101111)_2$
2 $(100010)_2$
3 $(100011)_2$
4 $(111111)_2$

Rough work

Apply Boolean algebra rules to determine the simplest forms of the given Boolean functions in the following THREE questions.

QUESTION 12

What is the simplest form of the Boolean function $(x + y')' + (x'y)'$?

1 x
2 0
3 x'y
4 1

QUESTION 13

What is the simplest form of the Boolean function $xy'z' + xy'z'$?

1 xy'z'
2 y'z'
3 x
4 1

QUESTION 14

What is the simplest form of the Boolean function $xyz + xy'z + x'yz' + x'y'z'$

1 xz
2 0
3 xz + x'z'
4 1

Rough work

Rough work

QUESTION 15

Consider the following Boolean function

$$F(x,y,z) = m_1 + m_3 + m_4 + m_6$$

Which one of the following four Karnaugh diagrams represents the given function?

1

	y'z'	y'z	yz	yz'
x'				1
x	1	1		1

2

	y'z'	y'z	yz	yz'
x'			1	1
x	1		1	

3

	y'z'	y'z	yz	yz'
x'			1	
x	1	1	1	

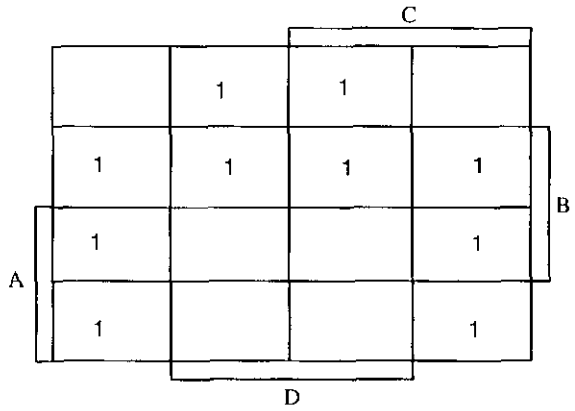
4

	y'z'	y'z	yz	yz'
x'		1	1	
x	1			1

Rough work

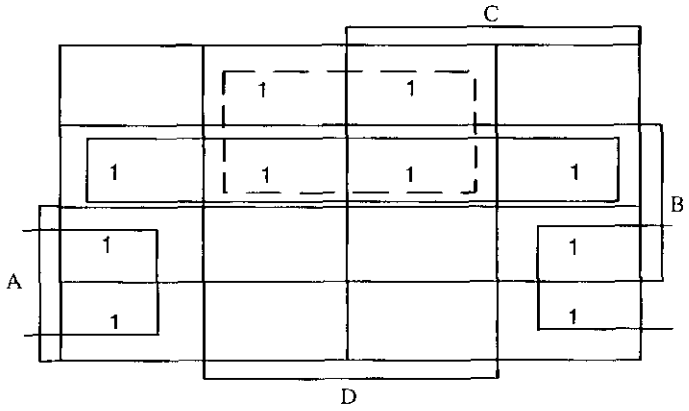
QUESTION 16

Consider the following Karnaugh map

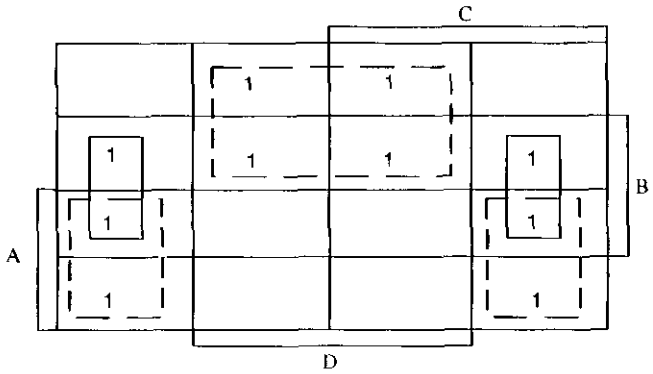


Which one of the following four Karnaugh maps reflects the correct forming of groups?

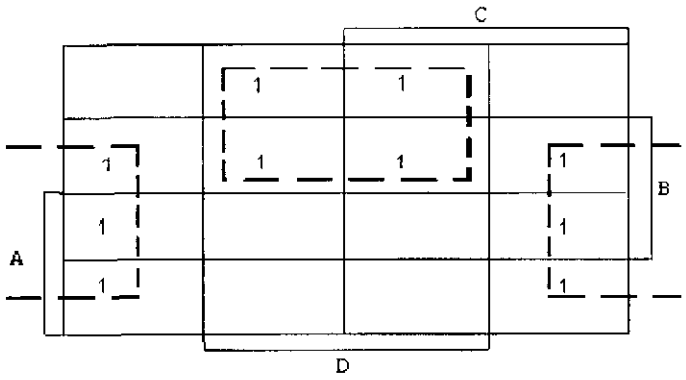
1



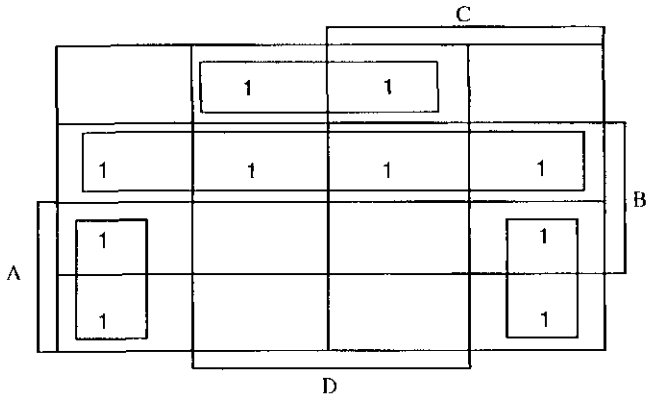
2



3

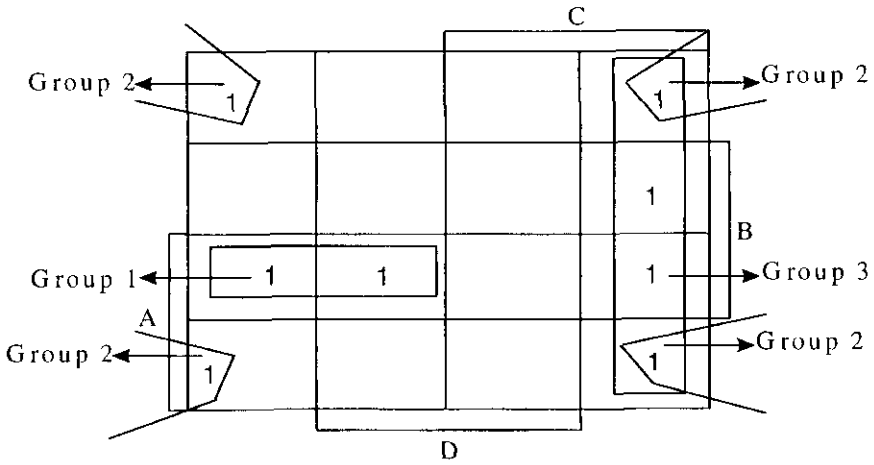


4



Rough work

The next THREE questions refer to the Karnaugh map beneath:



QUESTION 17
Which term represents Group 1?

1 B′D′
2 AB′C
3 AB′C′
4 ABC′

QUESTION 18
Which term represents Group 2?

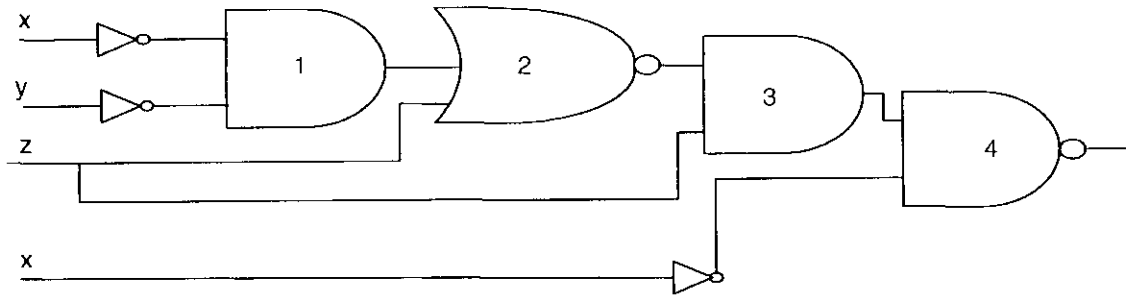
1 A′B′CD′
2 B′D′
3 A′
4 D′

QUESTION 19
Which term represents Group 3?

1 CD′
2 C′D
3 AC′
4 C′

Rough work

The next FOUR questions refer to the following combinational logic circuit:



QUESTION 20
What is the output of Gate 1?

1 $x'y'$
2 $x' + y'$
3 $(x + y)'$
4 $(xy)'$

QUESTION 21
What is the output of Gate 2?

1 $[(x' + y')\ z]'$
2 $[(x + y)'\ z]'$
3 $(xy)' + z'$
4 $(x'y' + z)'$

QUESTION 22
What is the output of Gate 3?

1 $[(x' + y')\ z]' + z$
2 $(x'y' + z)'\ z$
3 $[(xy)' + z']\ z$
4 $[(x + y)'\ z]' + z$

QUESTION 23
What is the output of Gate 4?

1 $[(x'y' + z)'\ z]'\ x'$
2 $[(x'y' + z)'\ z\ x']'$
3 $[[(x' + y')\ z]' + z + x']'$
4 $[(x + y)'\ z]' + z + x'$

Rough work

Consider the following scenario:

Three peoples like different games as follows
Person A Soccer & Rugby, **Person B** Cricket & Soccer, Person **C** Netball & Rugby

When a person likes two different games (as shown above), the output is 1 For example, if A = 1, B = 1 and C = 0, Person A likes soccer and rugby, and Person B likes Cricket and Soccer, so the group of three persons like only 3 different games (soccer, rugby & cricket)

A Boolean function F(A, B, C) outputs a 1 if a group of three persons like less than 4 different games

Different combination inputs for A, B and C are given in the tables in the following FOUR questions. Which alternative shows the correct outputs for F in EACH of the following FOUR questions?

QUESTION 24

			Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**F**	**F**	**F**	**F**
0	0	0	0	1	0	1
0	0	1	0	1	1	0

QUESTION 25

			Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**F**	**F**	**F**	**F**
0	1	0	0	1	0	1
0	1	1	0	1	1	0

QUESTION 26

			Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**F**	**F**	**F**	**F**
1	0	0	0	1	0	1
1	0	1	0	1	1	0

QUESTION 27

			Alternative 1	Alternative 2	Alternative 3	Alternative 4
A	**B**	**C**	**F**	**F**	**F**	**F**
1	1	0	0	1	0	1
1	1	1	0	1	1	0

Rough work

Section B: Computer systems, organisation and networks (18 marks)

QUESTION 28
The ALU performs three types of operation on data Which one of the following is NOT a logical operation?

1 XOT
2 XOR
3 NOT
4 AND

QUESTION 29
What is the second step in the procedure where the CPU needs to access a word in main memory?

1 The CPU checks the cache
2 The CPU accesses the main memory and copies the required block
3 The CPU checks the registers
4 The CPU accesses the cache and copies the word

QUESTION 30
In terms of computer storage devices, what does DVD stand for?

1 Digital versatile disk
2 Digital video disk
3 Data versatile disk
4 Data video disk

QUESTION 31
A computer has 1024 MB (1 gigabytes) of memory Each word in this computer is 64 bytes How many bits are needed to address each word in memory?

1 24
2 30
3 6
4 64

QUESTION 32
In the fetch stage of the machine cycle used by the CPU, _____

1 the address of the instruction to be copied is held in the program counter register
2 the contents of two input registers are added
3 instructions are decoded by the control unit
4 the task order is sent to a component in the CPU

QUESTION 33
Which one of the following is NOT a method for synchronisation of transfer of data from I/O devices to the CPU and memory?

1 Programmed I/O
2 Demand I/O
3 Interrupt-driven
4 Direct memory access (DMA)

QUESTION 34
Which of the following DOES NOT forms part of the conceptual view/ model of the Internet?

1 Servers
2 Provider network
3 Backbones
4 Peering Point

QUESTION 35
According to the prescribed textbook for this module, which of the following is the latest network paradigm?

1 Client-server
2 Main-frame
3 Wireless
4 Peer-to-peer

QUESTION 36
According to the prescribed textbook for this module, how many layers does the TCP/IP protocol suite have?

1 5
2 4
3 3
4 6

QUESTION 37
Which layer of the TCP/IP protocol is responsible for 'packetizing'?

1 Transport
2 Network
3 Data link
4 Physical

QUESTION 38
Which one of the following is NOT a wireless WAN?

1 ADSL network
2 WiMax
3 Cellular telephony network
4 Satellite network

QUESTION 39
Which one of the following is NOT related to networks made of guided transmission media?

1 Twisted-pair
2 Coaxial
3 Infrared
4 Fibre-optics

QUESTION 40

A_____ system is expected to do a task within specific time constraint

1 batch operating
2 time-sharing
3 quick response
4 real-time

QUESTION 41

Which of the following is responsible for loading other programs into memory for execution?

1 Boot process
2 Bootstrap process
3 Compile and Go process
4 Relating process

QUESTION 42

Multiprogramming requires a _____ operating system

1 batch
2 time-sharing
3 parallel
4 distributed

QUESTION 43

The _____ is the heart of the UNIX system

1 kernel
2 shell
3 program
4 application

QUESTION 44

Which one of the following is NOT a responsibility of the file manager?

1 It controls the naming of files
2 It is responsible for archiving and backups
3 It maintains a queue for each input/output device
4 It supervises the creation, deletion, and modification of files

QUESTION 45

Which two techniques belong to the Nonswapping category?

A Paging
B Partitioning
C Demand paging
D Demand segmentation

Alternatives
1 A and B
2 B and C
3 C and D
4 A and D

Section C: Computer algorithms, programming and software development

(18 marks)

QUESTION 46

A list contains the following elements

8 15 19 25 40 43 52 70 77 81 86 100 144

At the beginning, *first* = 1, *mid* = 7 and *last* = 13. What are the values of *first*, *mid* and *last*, respectively, after two iterations of the binary search algorithm if the goal is 40?

1 4, 5, 7
2 1, 4, 7
3 4, 5, 6
4 1, 3, 6

QUESTION 47

Suppose a list contains the following elements

4 17 8 11 16 14 29 32 5

What is the order of the elements in the list after three passes if selection sort is used?

1 4 5 11 17 16 14 29 32 8
2 4 5 8 16 17 14 29 32 11
3 4 5 8 17 16 14 29 32 11
4 4 5 8 11 14 16 17 29 32

QUESTION 48

What other name is given to the selection construct?

1 Sequence
2 Iteration
3 Decision
4 Repetition

QUESTION 49

_____ is a process in which an algorithm calls itself

1 Searching
2 Recursion
3 Subalgorithm
4 Summation

QUESTION 50

The term algorithm refers to a _____

1 step-by-step method for solving a problem
2 set of instructions in specified sequence
3 program in an procedural language
4 basic operation of a system

QUESTION 51

The following pseudo code is an example of _____ structure

Get number
While number is positive
Add to sum

1 sequence
2 decision
3 repetition
4 nested

QUESTION 52

The C++ language was developed by Bjarne Stroustrup at _____

1 IBM lab
2 Bell laboratories
3 Sun Microsystems lab
4 Microsoft lab

QUESTION 53

Java and C# can be categorised as_____ programing languages

1 procedural
2 Object Oriented
3 functional
4 declarative

QUESTION 54

The _____ parses a set of tokens to find instructions

1 Lexical analyser
2 Syntax analyser
3 Semantic analyser
4 Code generator

QUESTION 55

Which one of the following statements regarding a simple data types is NOT TRUE?

1 A real type is a number with fractional part
2 An integer type is a number with a fractional part
3 A Boolean type is type with only two values, male or female
4 A character type is a symbol in the underlying character set used by the language

QUESTION 56

What is the tool that is used to convert a source program into the object program called?

1 Compiler
2 Linker
3 Language translator
4 Processor

QUESTION 57

A _____ type is a set of elements in which each element is a simple type

1 simple
2 composite
3 variable
4 constants

QUESTION 58
Which phase is the last development phase in the *waterfall model*?

1 Design
2 Implementation
3 Testing
4 Coding

QUESTION 59
_____ diagram show the movement of data in the system

1 State
2 Use-case
3 Data flow
4 Entity-relationship

QUESTION 60
Cohesion is _____

1 a measure of how closely the modules in a system are related
2 a measure of how tightly two modules are bound to each other
3 a common tool for illustrating the relations between modules
4 the ability to move software from one hardware platform to another

QUESTION 61
Operability is one of the measures for software quality Operability includes _____

1 flexibility
2 efficiency
3 changeability
4 portability

QUESTION 62
What is the objective of the testing phase during software development?

1 To gain modularity
2 To analyse the system
3 To find errors
4 To audit the system

QUESTION 63
Glass-box testing is sometimes called?

1 Black-box testing
2 White-box testing
3 Data flow testing
4 Graph based testing

Section D: Computer data and file structure, and databases (17 marks)

QUESTION 64
Each element in a record is called _____

1 a variable
2 an index
3 a filed
4 a node

QUESTION 65
In a two-dimensional array we have the element with _____

1 row number 'i' and column number 'j'
2 row number 'j' and column number 'i'
3 row number 'i-1' and column number 'j-1'
4 element with row number 'j-1' and column number 'i-1'

QUESTION 66
Which one of the following defines the process of finding the index of the element with a given value?

1 Traversal
2 Search
3 Sort
4 Retrieve

QUESTION 67
The operation that is applied to all elements of the array, such as reading, writing, applying mathematical operation, and so on is known as_____

1 sorting
2 merging
3 inserting
4 traversal

QUESTION 68

In linked list each element contains?

A data
B link
C field
D record

Alternatives

1 A and B
2 C and D
3 A and D
4 B and C

QUESTION 69

Which one of the following best describes a linked list?

1 A collection of data stored in the internal format of the computer
2 A collection of different elements that can be stored on different locations
3 A collection of data in which each element contains the location of next element
4 A collection of related elements, possibly of different types, having a single name

QUESTION 70

In which type of file are records only accessed one-after-another from beginning to the end?

1 Random
2 Indexed
3 Sequential
4 Hashed

QUESTION 71

An indexed file consists of _____

1 a sequential data file
2 an index
3 a random data file
4 both 1 and 2 are correct

QUESTION 72

When using _____, selected digits are obtained from the key and used as the address

1 direct hashing
2 indirect hashing
3 modulo division hashing
4 digital extraction hashing

QUESTION 73
Which one of the following collision resolution methods resolves collisions in the prime area?

1 Linked list resolution
2 Bucket hashing resolution
3 Indirect remainder hashing
4 Open addressing resolution

QUESTION 74
The _____ directorate is the highest level in the file system hierarchy

1 home
2 root
3 parent
4 working

QUESTION 75
The _____ level determines where data is actually stored on the storage devices

1 physical
2 internal
3 conceptual
4 external

QUESTION 76
Which one of the following is NOT a DBMS?

1 Access
2 Oracle
3 Acrobat Reader
4 SQL Server

QUESTION 77
Which one of the following is a unary operator?

1 Join
2 Union
3 Project
4 Intersection

QUESTION 78

Which component of DBMS controls which user access which parts of the data in the database?

1 Hardware
2 Software
3 Users
4 Procedures

QUESTION 79

The _____ level of three-level DBMS architecture defines the logical view of the data

1 external
2 conceptual
3 internal
4 physical

QUESTION 80

Data is organised as an inverted tree in which database model?

1 Hierarchical
2 Network
3 Relational
4 Distributed

UNIVERSITY OF SOUTH AFRICA UNISA 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	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
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17	52	87	122
18	53	88	123
19	54	89	124
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23	58	93	128
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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