

**MARK SCHEME for the May/June 2012 question paper
for the guidance of teachers**

9691 COMPUTING

9691/32

Paper 3 (Written Paper), maximum raw mark 90

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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – May/June 2012	9691	32

- 1 (a) (i) The table/each student has a repeated group of attributes // each student has a number of subjects [1]
- (ii) StudentName, TutorGroup and Tutor would need to be repeated for each record [1]

(b)

Table: Student

StudentName	TutorGroup	Tutor
Tom	6	SAN
Joe	7	MEB
Samir	6	SAN

Table: StudentSubjectChoices

Student Name	Subject	Level	Subject Teacher
Tom	Physics	A	SAN
Tom	Chemistry	A	MEB
Tom	Gen Studies	AS	DIL
Joe	Geography	AS	ROG
Joe	French	AS	HEN
Samir	Computing	A	VAR
Samir	Chemistry	A	MEB
Samir	Maths	A	COR
Samir	Gen. Studies	A	DIL

Mark as follows

- Complete Student table [1]
- Repetition of StudentName in StudentSubjectChoices table [1]
- Complete columns 2, 3, and 4 [1]

- (c) (i) *primary key...*
 - an attribute/combination of attributes
 - chosen to ensure that the records in a table are unique // used to identify a record/tuple [2]
- (ii) StudentName + Subject Correct Answer Only [1]
- (iii) - there is a one-to-many relationship // Student is the 'one side' table – StudentSubjectChoices is the 'many side' table.
 - The primary key (attribute StudentName) in Student
 - Links to StudentName in the StudentSubjectChoices table
 - (StudentName in the) StudentSubjectChoices table is the foreign key // StudentName is the foreign key that links the two tables [MAX 2]

- (d) - There are non-key attributes ...
 - SubjectTeacher ...
 - dependent only on part of the primary key (i.e. Subject) // partial dependency [MAX 2]

- (e) - There are dependent non-key attributes // there are non-key dependencies
 - TutorGroup is dependant on Tutor // Tutor is dependent on TutorGroup [2]

[Total: 14]

- 2 (a) 83 [1]

- (b) 153 [1]

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – May/June 2012	9691	32

(c) –110 [1]

(d) (i) +13

mark as follows:

Exponent: +4 // move the pattern four places

Mantissa: +13/16 // 0.1101

Answer: $13/16 \times 2^4$ // or equivalent [3]

(ii) There will be a unique representation for a number

The format will ensure the number is represented with the greatest possible/more accuracy/precision

Multiplication is performed more accurately/precisely [MAX 1]

(iii) Mantissa: 0100 0000

Exponent: 1000

Therefore number is $\frac{1}{2} \times 2^{-8}$ // +1/512 // $+2^{-9}$ // 0.00195 [3]

(e) choices made will effect range and accuracy

More bits used for the mantissa will result in better accuracy

More bits use for the exponent will result in larger range of numbers [Max 2]

[Total: 12]

3 (a) Boolean [1]

Flags whether or not the requested customer name is found [1]

SearchName [1]

Index [1]

Index + 1 [1]

Index = 2001 // Index >= 2001 // Index > 2000 [1]

IsFound = FALSE // NOT IsFound // Index = 2001 // Index > 2000 [1]

(b) - values are considered in sequence

- when an item is not found all items are considered

- Few comparisons are needed if the value is near the start of the list // Many comparisons are needed/it's time consuming if the value is near the end of the list

- The average number of comparisons needed will be $N/2$ (or 1000 for this data set) [MAX 2]

(c) (i) The values must be in order

Calculate the middle value and compare with the requested value

If Requested value is less/greater discard the top/bottom list

Repeat with a new list // compare with a new middle value

Continue until value is found or list is empty [MAX 4]

(ii) *Compare with ...*

Kiwi

Banana

Cherry

[3]

[Total: 16]

4 (a) 21 [1]

(b) (i) $a^5 - bc + /$ [1]

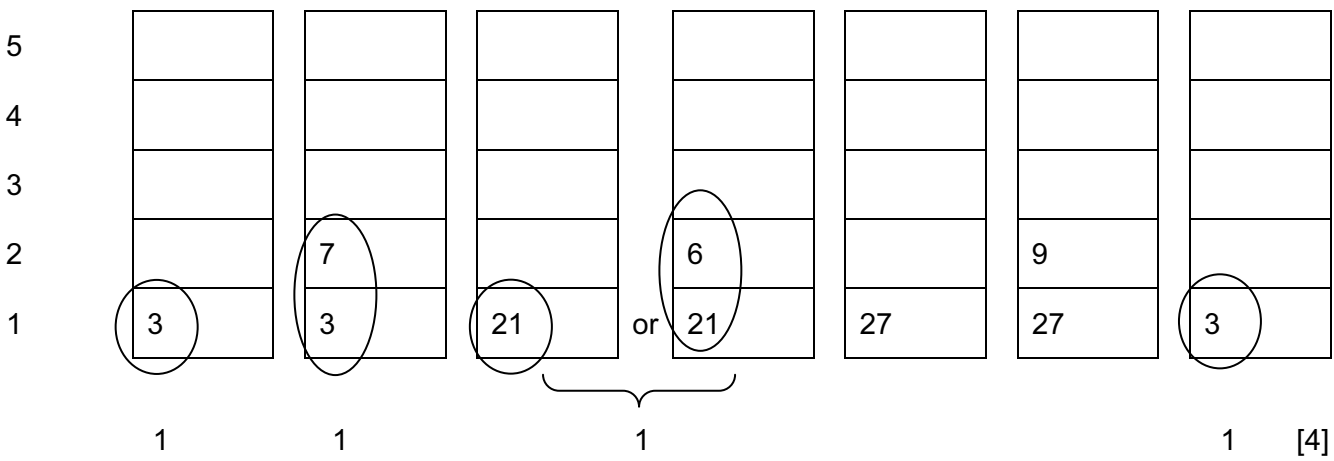
(ii) $2^3 * 6^2 / +$ [2]

(c) Expressions can be evaluated without the use of brackets
Operators are in execution order / No need to apply a precedence of operators [1]

(d) (i) Last item added to the stack will be the first item to leave [1]

(ii) **Static** structure
The size of the array will be fixed / size will be defined before the array is used [2]

(iii)



[Total: 12]

5 (a)

LDD 105

Accumulator
0001 0001

Main memory	
100	0100 0000
101	0110 1011
102	1111 1110
103	1111 1010
104	0101 1101
105	0001 0001
106	1010 1000
107	1100 0001
200	1001 1111

Mark as follows:

- Sensible annotation which makes clear 105 is the address used
- Final value in Acc

[2]

(b)

LDX 101

Accumulator

0101 1101

Index Register

00000011

Main memory	
100	0100 0000
101	0110 1011
102	1111 1110
103	1111 1010
104	0101 1101
105	0001 0001
106	1010 1000
107	1100 0001
200	1001 1111

Mark as follows:

- IR contents converted to 3
- Computed address of 101 + 3 = 104
- // explanation: add contents of IR to address part of instruction
- Then, 'direct addressing' to 104
- Final value in Acc

[MAX 4]

(c)

Accumulator	Memory Address			
	507	508	509	510
22	22	170	0	0
23				
			23	
170				
171				
				171

Mark as follows ...

- 22 to Accumulator
- Incremented to 23
- 23 copied to address 509
- 170 copied to Accumulator and incremented to 171
- 171 in address 510

[5]

(d) Every assembly language instruction is translated into exactly one machine code instruction / there is a 1-to-1 relationship between them [1]

[Total: 11]

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – May/June 2012	9691	32

- 6 (a) Decide which process ...
 Gets next use of the processor (low level scheduler)
 // is next loaded into memory (high level scheduler)
 maximise system resources [2]
- (b) (i) Running
 The process currently has the use of the processor
- Runnable/Ready
 The process would like to use the processor but the processor is currently in use by another process
- Suspended/Blocked
 The process is not capable of using the processor / the process is currently occupied doing I/O [6]
- (ii) Maintain a separate 'data structure' for the processes in each state
 one field of the Process Control Block will store the current state [1]
- (c) (i) *Processor bound ...*
 The process does very little I/O // the process requires the processor most of the time
 3D-graphics calculation // any plausible application
- I/O bound ...*
 The process does lots of I/O // the process requires little processor time // any plausible application [4]
- (ii) Priority to I/O bound processes
 Otherwise they will not get a look in // processor bound jobs would monopolise the processor [2]
- [Total: 15]**
- 7 (a) a model/program of the real-world system is produced
 to predict the likely behaviour of a real-world system [2]
- (b) *Computer system suitable as ...*
 A computer program/system can be written/created which model the problem/application
 The problem can control the values of all the variables/parameters
 The computer can produce results very quickly // e.g. models what actually takes several days into 5 minutes processing
 The simulation removes any element of hazard/danger
 Some real-world problems are impossible to create
 It will be cost-effective to model the problem first [MAX 2]

Page 7	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – May/June 2012	9691	32

- (c) Time taken to serve a customer
Number of items in the customer basket
Acceptable wait time in the queue
Number of checkouts
Time of day/day of the week
Number of customers arriving
Speed of the checkout operators
Anything plausible ... [MAX 3]

- (d) - Increase the average time taken to serve a customer
- ... will increase the average queue length
Or anything plausible ... [2]

[Total: 9]