5 Appendices

5a. Overlap with other qualifications

The knowledge, understanding and skills that are developed throughout this qualification are distinct and have very little overlap with other qualifications.

This overlap may occur only at level 5 in the hardware and software elements of ICT Cambridge Technicals and GCE Applied ICT.

5b. Avoidance of bias

The A level qualification and subject criteria have been reviewed in order to identify any feature which could disadvantage candidates who share a protected characteristic as defined by the Equality Act 2010. All reasonable steps have been taken to minimise any such disadvantage.

5c. Mathematical skills

Computer Science uses mathematics to express its computational laws and processes.

All AS level and A level Computer Science qualifications must contain a minimum of 10% mathematical skills. Candidates may be asked to demonstrate their knowledge, understanding and skills of computational processes and problem solving in both theoretical and practical ways. The following list of topics will be counted as Level 2 (or higher) mathematics.

Topic:

- Boolean algebra
- comparison of complexity of algorithms
- number representation and bases

Whilst the concept for each topic is Level 2 (though it may not appear in GCSE mathematics specifications) candidates will, however be expected to apply the skills in a Level 3 context.

5d. Languages and Boolean logic guide for use in external assessments

The tables below show languages and logic that will be used in the external assessments and indicates the limits and scope of each.

Centres are free to go beyond these parameters.

Pseudocode

The following guide shows the format pseudocode will appear in the examined components. It is provided to allow you to give learners familiarity before the exam. Learners are not expected to memorise the syntax of this pseudocode and when asked may provide answers in any style of pseudocode they choose providing its meaning could be reasonably inferred by a competent programmer.

Variables
Variables are assigned using the = operator.

```
x=3
name="Bob"
```

A variable is declared the first time a value is assigned. It assumes the data type of the value it is given.

Variables declared inside a function or procedure are local to that subroutine.

Variables in the main program can be made global with the keyword `global`.

```
global userid = 123
```

Casting
Variables can be typecast using the `int str` and `float` functions.

`str(3)` returns "3"
`int ("3")` returns 3
`float ("3.14")` returns `3.14`

Outputting to Screen
`print(`*string*`)`

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Example

```
print("hello")
```

Taking Input from User
variable`=input(`*prompt to user*`)`

Example

```
name=input("Please enter your name")
```

Iteration – Count Controlled

```
for i=0 to 7
    print("Hello")
next i
```

Will print hello 8 times (0–7 inclusive).

Iteration – Condition Controlled

```
while answer!="computer"
    answer=input("What is the password?")
endwhile
```

```
do
    answer=input("What is the password?")
until answer=="computer"
```

Logical Operators

```
AND OR NOT
```

```
e.g.
while x<=5 AND flag==false
```

Comparison Operators

==	Equal to
!=	Not equal to
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to

Arithmetic Operators

+	Addition e.g. x=6+5 gives 11
–	Subtraction e.g. x=6–5 gives 1
*	Multiplication e.g. x=12*2 gives 24
/	Division e.g. x=12/2 gives 6
MOD	Modulus e.g. 12MOD5 gives 2
DIV	Quotient e.g. 17DIV5 gives 3
^	Exponentiation e.g. 3^4 gives 81

Selection

Selection will be carried out with if/else and switch/case

if/else

```
if entry=="a" then
    print("You selected A")
elseif entry=="b" then
    print("You selected B")
else
    print("Unrecognised selection")
endif
```

switch/case

```
switch entry:
     case "A":
        print("You selected A")
     case "B":1
        print("You selected B")
     default:
        print("Unrecognised selection")

endswitch
```

String Handling

To get the length of a string:

```
stringname.length
```

To get a substring:

```
stringname.subString(startingPosition, numberOfCharacters)
```

NB The string will start with the 0th character.

Example

```
someText="Computer Science"

print(someText.length)
print(someText.substring(3,3))
```

Will display

```
16
put
```

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Subroutines

```
function triple(number)
    return number*3
endfunction
```

Called from main program

```
y=triple(7)
```

```
procedure greeting(name)
    print("hello"+name)
endprocedure
```

Called from main program

```
greeting("Hamish")
```

Unless stated values passed to subroutines can be assumed to be passed by value.
If this is relevant to the question byVal and byRef will be used. In the case below x is passed by value and y is passed by reference.

```
procedure foobar(x:byVal, y:byRef)
    …
    …
endprocedure
```

Arrays

Arrays will be 0 based and declared with the keyword *array*.

```
array names[5]
names[0]="Ahmad"
names[1]="Ben"
names[2]="Catherine"
names[3]="Dana"
names[4]="Elijah"

print(names[3])
```

Example of 2D array:

```
Array board[8,8]
board[0,0]="rook"
```

Reading to and Writing from Files

To open a file to read from openRead is used and readLine to return a line of text from the file.

The following program makes x the first line of sample.txt

```
myFile = openRead("sample.txt")
x = myFile.readLine()
myFile.close()
```

`endOfFile()` is used to determine the end of the file. The following program will print out the contents of sample.txt

```
myFile = openRead("sample.txt")
while NOT myFile.endOfFile()
    print(myFile.readLine())
endwhile
myFile.close()
```

To open a file to write to openWrite is used and writeLine to add a line of text to the file. In the program below hello world is made the contents of sample.txt (any previous contents are overwritten).

```
myFile = openWrite("sample.txt")
myFile.writeLine("Hello World")
myFile.close()
```

Comments

Comments are denoted by //

```
print("Hello World") //This is a comment
```

Object-Oriented

Object oriented code will match the pseudocode listed above with the following extensions:

Methods and Attributes:

Methods and attributes can be assumed to be public unless otherwise stated. Where the access level is relevant to the question it will always be explicit in the code denoted by the keywords.

```
public and private.

private attempts = 3

public procedure setAttempts(number)
    attempts=number
endprocedure

private function getAttempts()
    return attempts
endfunction
```

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Methods will always be instance methods, learners aren't expected to be aware of static methods. They will be called using object.method so

```
player.setAttempts(5)

print(player.getAttempts())
```

Constructors and Inheritance
Inheritance is denoted by the `inherits` keyword, superclass methods will be called with the keyword super. i.e. `super.methodName(`*parameters*`)` in the case of the constructor this would be `super.new()`
Constructors will be procedures with the name new.

```
class Pet

    private name
     public procedure new(givenName)
        name=givenName

     endprocedure

endclass


class Dog inherits Pet

    private breed

     public procedure new(givenName, givenBreed)
        super.new(givenName)
        breed=givenBreed
     endprocedure

endclass
```

Constructors and Inheritance

Constructors will be procedures with the name new.

```
class Pet

    private name
    public procedure new(givenName)
        name=givenName

    endprocedure

endclass
```

Inheritance is denoted by the `inherits` keyword, superclass methods will be called with the keyword super. i.e. `super.methodName(`*parameters*`)` in the case of the constructor this would be `super.new()`

```
class Dog inherits Pet

    private breed

    public procedure new(givenName, givenBreed)
       super.new(givenName)
       breed=givenBreed
    endprocedure

endclass
```

To create an instance of an object the following format is used

objectName = new *className*(*parameters*)

e.g.

```
myDog = new Dog("Fido", "Scottish Terrier")
```

HTML

Learners are expected to have an awareness of the following tags. Any other tags used will be introduced in the question.

<html>
<link> to link to a CSS file
<head>

<title>

<body>

<h1> <h2> <h3>

<img> including the src, alt, height and width attributes.

<a> including the href attribute.

<form>

<input> where the input is a textbox (i.e. has the attribute type="text" and another attribute name to identify it) or a submit button (i.e. has the attribute type="submit")

<p>

<script>

Any other elements used will be explained in the question.

CSS

Learners are expected to be able to use CSS directly inside elements using the style attribute

```
<h1 style="color:blue;">
```

and external style sheets. In the style sheets they should be able to use CSS to define the styling of elements:

```
h1{
    color:blue;
}
```

classes

```
.infoBox{
    background-color: green;
}
```

and Identifiers

```
#menu{
    background-color: #A2441B;
}
```

They are expected to be familiar with the following properties.

```
background-color
border-color
border-style
border-width
color with named and hex colours
font-family
font-size
height
width
```

Any other properties used will be explained in the question.

JavaScript

Learners are expected to be able to follow and write basic JavaScript code. It is hoped they will get practical experience of JavaScript in their study of the course. They will not be expected to commit exact details of syntax to memory. Questions in the exam will not penalise learners for minor inaccuracies in syntax. Learners *will* be expected to be familiar with the JavaScript equivalents of the structures listed in the pseudocode section (with the exception of input and output (see below). They will not be expected to use JavaScript for Object Oriented programming or file handling. Questions will not be asked in JavaScript where something is passed to a subroutine by value or reference is relevant.

Input

Input will be taken in by reading values from a form. *NB learners will not be expected to memorise the method for doing this as focus will be on what they do with that input once it is received.*

Output

By changing the contents of an HTML element

```
chosenElement = document.getElementById("example");
chosenElement.innerHTML = "Hello World";
```

By writing directly to the document

```
document.write("Hello World");
```

By using an alert box

```
alert("Hello World");
```

Any other JavaScript used will be explained in the question.

Little Man Computer Instruction Set

In questions mnemonics will always be given according to the left hand column below. Different implementations of LMC have slight variations in mnemonics used and to take this into account the alternative mnemonics in the right hand column will be accepted in learners' answers.

Mnemonic	Instruction	Alternative mnemonics accepted
ADD	Add	
SUB	Subtract	
STA	Store	STO
LDA	Load	LOAD
BRA	Branch always	BR
BRZ	Branch if zero	BZ
BRP	Branch if positive	BP
INP	Input	IN, INPUT
OUT	Output	
HLT	End program	COB, END
DAT	Data location	

Structured Query Language (SQL)

Learners will be expected to be familiar with the structures below. Should any other aspects of SQL be used they will be introduced and explained in the question.

`SELECT` (including nested SELECTs)

`FROM`

`WHERE`

`LIKE`

`AND`

`OR`

`DELETE`

`INSERT`

`DROP`

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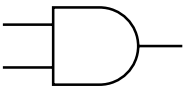
`JOIN` (Which is equivalent to INNER JOIN, there is no expectation to know about outer, left and right joins)

`WILDCARDS` (Learners should be familiar in the use of '*' and '%' as a wildcard to facilitate searching and matching where appropriate)

Boolean Algebra

When Boolean algebra is used in questions the notation described below will be used. Other forms of notation exist and below are also a list of accepted notation we will accept from learners.

Conjunction



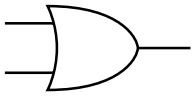
Notation used:
$\wedge$ e.g. A $\wedge$ B

A	B	A $\wedge$ B
T	T	T
T	F	F
F	T	F
F	F	F

Alternatives accepted:

AND e.g. A AND B
e.g. A.B

Disjunction



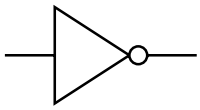
Notation used:
$\vee$ e.g. A $\vee$ B

A	B	A $\vee$ B
T	T	T
T	F	T
F	T	T
F	F	F

Alternatives accepted:

OR e.g. A OR B
+ e.g. A+B

Negation



Notation used:
¬ e.g. ¬A

A	¬A
T	F
F	T

Alternatives Accepted:
bar e.g. $\overline{A}$
~ e.g. ~A
NOT e.g. NOT A

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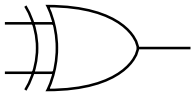
Exclusive Disjunction



Notation used:
$\veebar$ e.g. $A \veebar B$

A	B	$A \veebar B$
T	T	F
T	F	T
F	T	T
F	F	F

Alternatives accepted:

XOR e.g. A XOR B
$\oplus$ e.g. $A \oplus B$

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Equivalence / Iff

Notation used:
$\equiv$ e.g. $(A \wedge B) \equiv \neg(\neg A \vee \neg B)$

Alternatives accepted:
$\leftrightarrow$