



Faculty of Computing, IT and Creative Media

A level Computing



SUMMER ASSIGNMENT

Student Name: _____

A level Computing

QUALIFICATION NAME:

WJEC A level in computer science

WEB LINK: [HTTPS://WWW.WJEC.CO.UK/QUALIFICATIONS/COMPUTER-SCIENCE-AS-A-LEVEL/#TAB_OVERVIEW](https://www.wjec.co.uk/qualifications/computer-science-as-a-level/#TAB_OVERVIEW)

COMPONENTS IN YEAR 1 & 2

Component 1: Programming and System Development

This component investigates programs, algorithms, logic, programming methodologies and the impact of computer science on society.

Component 2: Computer Architecture, Data, Communication and Applications

This component investigates computer architecture, communication, data representation, data structures, programs, algorithms and software applications. There are no optional questions.

COMPONENTS IN YEAR 2

Component 3: Programmed Solution to a Problem

Students discuss, investigate, design, prototype, refine and implement, test and evaluate a computerised solution to a problem chosen by the student which must be solved using original code (programming).

Exams are taken at the end of the 2 years and include:

Component 1: Programming & System Development: a 2 hour 45 minutes written exam

Component 2: Computer Architecture, Data, Communications and Applications: a 2 hour written exam

Project based on 'Programme Solutions to a problem': a project completed by the student, assisted by teachers

A level COMPUTER SCIENCE

A decimal whole number into its binary equivalent?

Number	Quotient	Remainder
8	$8/2 = 4$	0
	$4/2 = 2$	0
	$2/2 = 1$	0
	$1/2 = 0$	1

The number to be converted

There are remainders recorded from repetitively dividing the quotients.

Since "Bi" means two therefore divide 8 by 2 to get 4 (quotient) and remainder 0. Divide the Quotient (4) by 2 and record remainder 0. Repeat the process until the quotient is 0.

The exemplar shown below is a worksheet showing the mechanical way of achieving the same thing explained above, converting a whole number to its binary equivalent.

	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^6	2^7
Enter number	1	2	4	8	16	32	64	128	256
5	1	0	1	0	0	0	0	0	0
7	1	1	1	0	0	0	0	0	0
25	1	0	0	1	1	0	0	0	0

Worked example

To obtain the binary value of **5** you need to do the following

$$1 \times 1 + 0 \times 2 + 1 \times 4 + 0 \times 8 + 0 \times 16 + 0 \times 32 + 0 \times 64 + 0 \times 128 + 0 \times 256 = 5$$

Activity 1

Complete the follow worksheet by working the binaries of the following numbers given in the first column of the worksheet.

	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^6	2^7
Enter number	1	2	4	8	16	32	64	128	256
5	1	0	1	0	0	0	0	0	0
45									
67									
75									
87									
125									
200									

Activity 2

Show calculations to show how you obtained your binary values in your worksheet.

The While Loop?

The While Loop

With the **while** loop we can execute a set of statements as long as a condition is true. Let's see how Python's `while` statement is used to construct loops. We'll start simple and embellish as we go.

The format of a rudimentary **while** loop is shown below:

```
while <expr>:  
    <statement(s)>  
<statement(s)>
```

represents the block to be repeatedly executed, often referred to as the body of the loop. This is denoted with indentation, just as in an `if` statement.

Remember: All control structures in Python use indentation to define blocks.

The controlling expression, **<expr>**, typically involves *one or more variables* that are initialized prior to starting the loop and then modified somewhere in the loop body.

When a `while` loop is encountered, **<expr>** is first evaluated to check if it is true or false. If it is true, the loop body is executed. The, **<expr>** is checked again, and if still true, the body is executed again. This continues until, **<expr>** becomes *false*, at which point program execution proceeds to the first statement beyond the loop body.

Consider this loop:

```
>>>  
1 n = 5  
2 while n > 0:  
3     n -= 1  
4     print(n)  
5 print("n is no longer greater than 0. Hence exit while loop")  
6 4  
7 3  
8 2  
9 1  
10 0
```

Here's what's happening in the example above:

- n is initially 5. The expression in the `while` statement header on line 2 is $n > 0$, which is true, so the loop body executes. Inside the loop body on line 3, n is decremented by 1 to 4, and then printed in line 6.
- When the body of the loop has finished, program execution returns to the top of the loop at line 2, and the expression is evaluated again. It is still true, so the body executes again, and 3 is printed. See line 7.
- This continues until n becomes 0. At that point, when the expression is tested, it is *false*, and the loop terminates. Execution would resume at the first statement following the loop body, line 5 in this case.

Activity 2

Study the code below and write the output the code produces

```
i = 1
while i < 6:
    print(i)
    i += 1
```

Activity 3

Study the code below and write the output the code produces:

```
i = 1
while i < 6:
    print(i)
    i = i + 1
```

Activity 4

Study the code below and write the output the code produces:

```
n = 5
while n > 0:
    print(n)
    n = n - 1
If n==0:
    Exit
```

Activity 5

Write a program in Python, using the *While* statement, that will convert whole number to its binary equivalent binary

e.g., 9 converts to 1001.

EXTENSION TASK

Study the purpose of **For** Loop. Write the differences between **While** loop and **For** loop.

COVID 19 CHALLENGE 1

COVID19 Who gets ventilator priority?

When hospitals face **ventilator shortages** during the Covid-19 pandemic crisis, they often rely on state policies to determine which patients are assigned the equipment. For example, medical personnel who get sick have priority for ventilators. Many other hospitals determine patient priority from a formula using a patient's prognosis and age. Those rules address **tough decisions**, but as constituted they also raise questions about **equity**, since these policies prioritize **particular groups** — such as **health care workers** and younger patients.

Your task is to **design** and **develop** an alternative called a “**reserve system**” that would allocate medical resources among multiple groups (**general public** , **frontline health care workers**, **patients who need ventilators due to non-Covid-19 illnesses**, **any other categories**,...) at the same time, rather than applying a single set of criteria to all patients. the concept also relates to the distribution of **tests**, **therapeutic treatments**, and **vaccines** — any medical resource where demand exceeds supply. Hospitals could have **one ventilator reserve for the general public**, **one for frontline health care workers**, **one for patients who need ventilators due to non-Covid-19 illnesses**, or **use additional categories**. You can use any of the following programming language to produce your final proposal:

1. Java
2. Python
3. Visual Basin

COVID 19 CHALLENGE 2

3 Questions on moving **teaching online** amid the Covid-19 pandemic:

With the onset of Covid-19 pandemic, schools, colleges and universities rapidly launched new services and enhanced others to meet the expanding needs of a community moving **fully into online teaching, learning, and working**. Every **new use of technology** in **teaching, learning, and working** comes with new challenges, questions, and calls for help. Your task as a director of IT support is to answer the following three questions:

1. Describe your work under “normal” circumstances before COVID19- consider describing any technology that was used **before** the pandemic?
2. Describe how your office mobilized to meet the challenge of going **virtual/remote**- consider all the new technology used (at **least three**), the **benefits, drawbacks** and **highlight** any major cybersecurity issues and how you have **prevented** this?
3. Describe how you have ensure that your staff are motivated?

COVID 19 CYBERSECURITY

Since the **COVID-19 pandemic**, many IT system have be targeted by **cyber criminals** and there have been reports in the news that the Office for National Statistics reported an increase in **cybercrime** offences. Your local charity director has approached you to **investigate** and **report** on current **security threats** to their web site and systems.

He has also asked you to investigate encryption methods and how these could be used to keep their web site and systems secure.

Write a **report** in which you:

- **explain** the current IT security threats to which organisations are exposed. Investigate the following websites to gather information on the current security issues.
 - [BBC news](#) (Technology section)
 - [Biggest Security Threats](#) of 2017
 - [ITProportal.com](#)