

Merge Sort

- A 2 9 7 8 4 1 3 10
- B 7 9 12 4 6 10 4 1
- C 17 12 19 7 8 14 28 3

Sort the above numbers using the **merge sort** algorithm.
Show the numbers being divided and merged as shown in the example.

Compare!

BUBBLE	INSERTION	MERGE

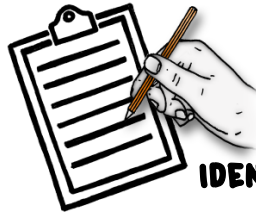
LINEAR	BINARY

Bubble Sort

Insertion Sort



Know IT ALGORITHM



**IDENTIFY A PROBLEM.
USE DECOMPOSITION TO
IDENTIFY ALL OF THE
SUBPROBLEM YOU WOULD
BE REQUIRED TO ADDRESS.**

Binary Search

```
01101100
01101111
01110110
01100101
```

Choose a sorting / searching algorithm.

List the different steps required to complete the algorithm and either represent these as a **flow diagram** and/or **pseudocode**.

Linear Search

Design!

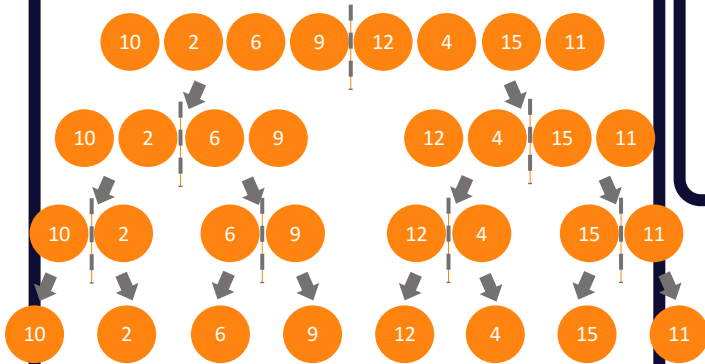
Create an algorithm for one of the situations below!
(Your algorithm can either be a **flow diagram** or **pseudo code**)
Make your algorithms as **efficient** as possible!

- 1) Create an algorithm for a guessing game. It is a two person game. The first player gets to enter a number. The second player gets three guesses to guess the number. They either get told that they are correct or to guess again!
- 2) Create an algorithm for a binary, denary and hexadecimal convertor. The user should be able to enter their conversion and the number which they wish to convert. They should be asked for another number to convert until they enter 'Exit'.
- 3) A quiz which asks 10 random maths questions from +, -, * and /. **Expand** - ask for an answer to each question and/or keep score as they go along. *Hint: You will have to GENERATE random number*

Merge Sort - Summarise the method of a merge sort.

The **merge sort** works by dividing the list into sublists until each sublist contains a single item before repeatedly merging the sublists until an ordered list remains.

Step 1: Repeatedly divide the list into sublists until you have individual items.



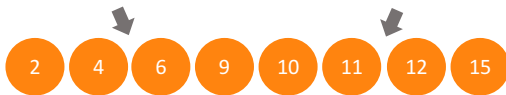
Step 2: Begin to merge the sublists together, rearranging them if necessary.



Step 3: Continue to merge the sublists, rearranging them if necessary.



Step 4: Continue to merge the sublists, rearranging them if necessary.



You will be left with a list which is ordered!

Sorting and Searching Algorithms

The stages of the **merge sort** algorithm are often referred to as 'divide', 'conquer' and 'combine'. Which stages do you think these are used in reference to?

Investigate/compare the **binary search** and **linear search** algorithms in terms of efficiency. Which is more efficient? Focus your comparison on time.

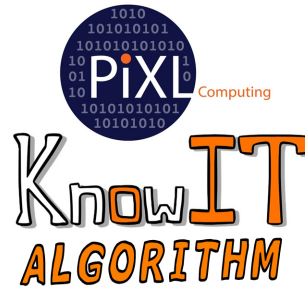
Investigate/compare the **bubble sort** and **merge search** algorithms in terms of efficiency. Which is more efficient? Focus your comparison on time.

Investigate/compare the **merge sort** and **insertion sort** algorithms in terms of efficiency. Which is more efficient? Focus your comparison on time.

Investigate/compare the **bubble sort** and **insertion sort** algorithms in terms of efficiency. Which is more efficient? Focus your comparison on time.

The example of merge sort used contains an even list of numbers. Will the method change if an odd list of numbers is used?

Demonstrate a merge sort using an odd list of numbers.



Computational Thinking

Explain why the use of abstraction is important when designing algorithms.

Explain why the use of decomposition is important when designing algorithms.

Taking the game 'Hang Man', use **decomposition** to **identify** all of the subproblem that you would need to address to create the game on a computer.

Algorithms

Compare the two different methods of writing algorithms, which is best? **Justify** your decision.

Discuss which method of creating algorithms you feel is best suited for a programmer to use? **Justify** your answer.

Explain why is it important that algorithms are **efficient**. If possible, **link** this to the hardware topic.

Explain the difference between a **while loop** and a **for loop**. Give an **example** where each should be used.

Which **loop** would you use for the following situations? **Explain/justify** your answer.

- To read each letter in a person's name.
- To repeat the 5 times table from 1 x 5 to 10 x 5.
- To make a user re-enter a password if it is incorrect.