# PiXL Spine - Computer Science – Programming Constructs

Programming constructs are important to ensure you are able to control the flow of a program. There are three programming constructs you need to be aware of:

- Sequence
- Selection
- Iteration

Write a definition for each of the programming constructs:

| | |
|---|---|
| Sequence | |
| Selection | |
| Iteration | |

**Sequence**

The following algorithm uses sequence.

1. input number1
2. input number2
3. result = number1 * number2
4. print result


| How is sequence used in this algorithm? |
|---|
| |

We use variables in programming as a location in memory, which holds a value which can change while the program is running.

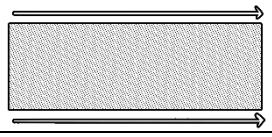

| Name any variables from the above example algorithm. |
|---|
| |

Variables should be assigned an appropriate data type in order to store and handle the data correctly. Complete the following table to describe each data type and give an example of data which may be stored under this data type.

| Data type | Description | Example |
|---|---|---|
| Integer | | |
| Float | | |
| String | | |
| Char | | |
| Boolean | | |

Look at the following pseudo code. Fill in the gaps to complete the algorithm.

1. _____ width
2. input _____
3. area = _____ * height
4. print "The area of the rectangle is", _____



Write pseudo code for a program which allows the user to enter two numbers. The program should output the result of addition, subtraction, multiplication and division of the two numbers.

**Selection**

Selection is used in programming when a condition determines which of the statements should be executed. There may be situations when none of the conditions are met; in this case, none of the statements will be executed.

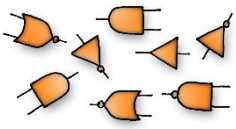
The following algorithms uses selection.

```
1. number = 20
2. input guess
3. if number = guess then
4.         print “Well done number is correctly”
5. else
6.         print “Try again next time”
7. endif
```

How is selection used in this algorithm?

Write pseudo code for a program which asks for the user's age. The program should output if the user can vote or not. They must be 18 or over to vote.

Write pseudo code for a program which outputs the results of an AND gate.



Write pseudo code using a Select-Case statement which takes in an exam grade from the user. The program will output A* if the result is 80+, A if the result is 70+, B if the result is 50+, C if the result is 40+ or Fail below 40.

## Iteration

Iteration is when a set of instructions are repeated within a program. This could be a particular number of times, which is known as a count controlled loop, or until a condition is met, which is known as a condition controlled.

Examples:

- For
- While
- Repeat

| Write the pseudo code for a program that counts from 1 to 100. |
|---|
| |
| **Edit your pseudo code for the above program so it counts from 100 to 1.** |
| |

Two types of programming errors are syntax and logical errors.


- **Syntax error** is when there is an error in the rules or the grammar of the language. These can be diagnosed by the translator.
- **Logical error** is when there is an error in the program which prevents it from running as the user expected it to do. This will not be found by the translator.

| Look at the algorithm below. Identify the error and state if the error is syntax or logical. | | |
|---|---|---|
| **Algorithm** | **Syntax or Logical?** | **What is the error?** |
| Prints number 0 to 10.<br>1. i = 0<br>2. while i > 11:<br>3. print (i)<br>4. i = i + 1<br>5. endwhile | | |

The following algorithm allows the user to guess a number.

```
1.  number = 20
2.  input guess
3.  if number = guess then
4.      print “Well done number is correctly”
5.  else
6.      print “Try again next time”
7.  endif
```

| Rewrite the algorithm so the user is able to make 5 guesses. |
| --- |
| |

| Describe the benefits to a programmer using iteration to enable the user of a guessing game to make a particular number of guesses. |
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| |

| Write pseudo code for a program that prints numbers from 1 to 100. For multiples of three, print “Fizz” instead of the number and for the multiples of five, print “Buzz”. For numbers which are multiples of both three and five, print “FizzBuzz”. |
| --- |
| |

**Extension**

The algorithm below checks whether a given string is a palindrome (spelt the same backwards as it is forwards - e.g. madam or level). The program will return true if it is a palindrome and false if not. Comment each line next to "#" to explain what is happening at each stage of the program.

```
#
input word
#
front = 1
#
end = word.length
#
palindrome = False
#
while front < end
        #
        if  word[front] == word[end] then
                front = front +1
                end = end -1
                palindrome = True
        else
                Return False
        endif
endwhile
#
if palindrome == True
        Return True
endif
```