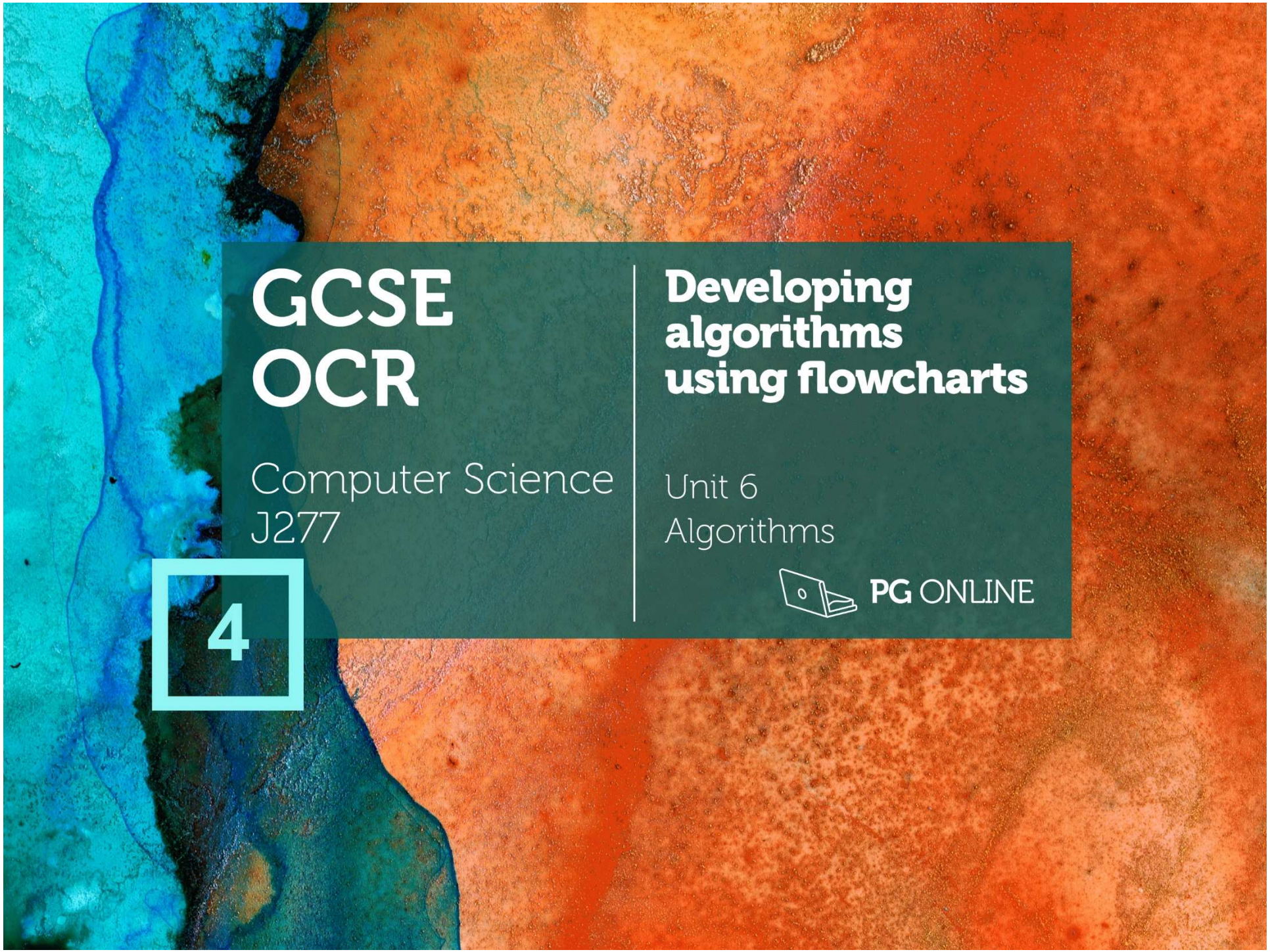
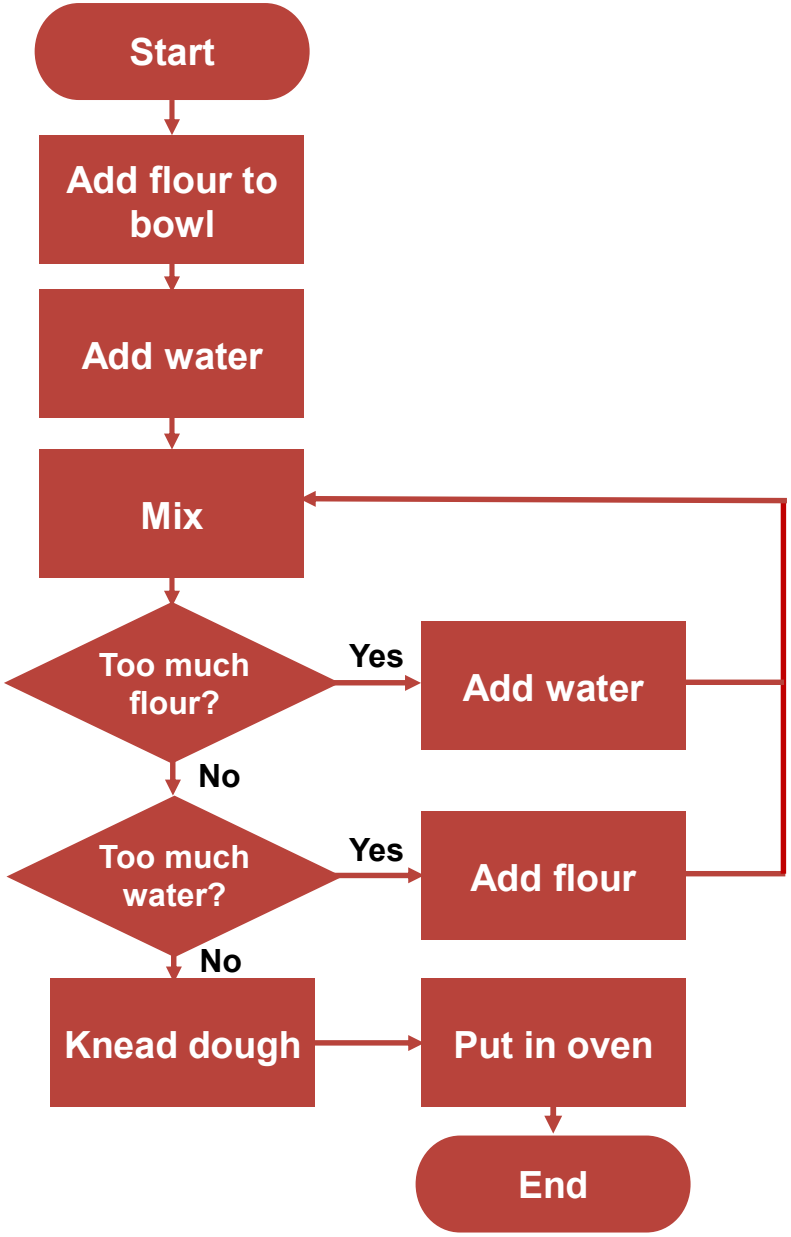

GCSE
OCR
Computer Science
J277
4
Developing algorithms using flowcharts
Unit 6
Algorithms
PG ONLINE

Objectives

- Understand flowchart symbols
- Create, interpret, correct, complete and refine algorithms using flowcharts
- Understand arithmetic operators and variables

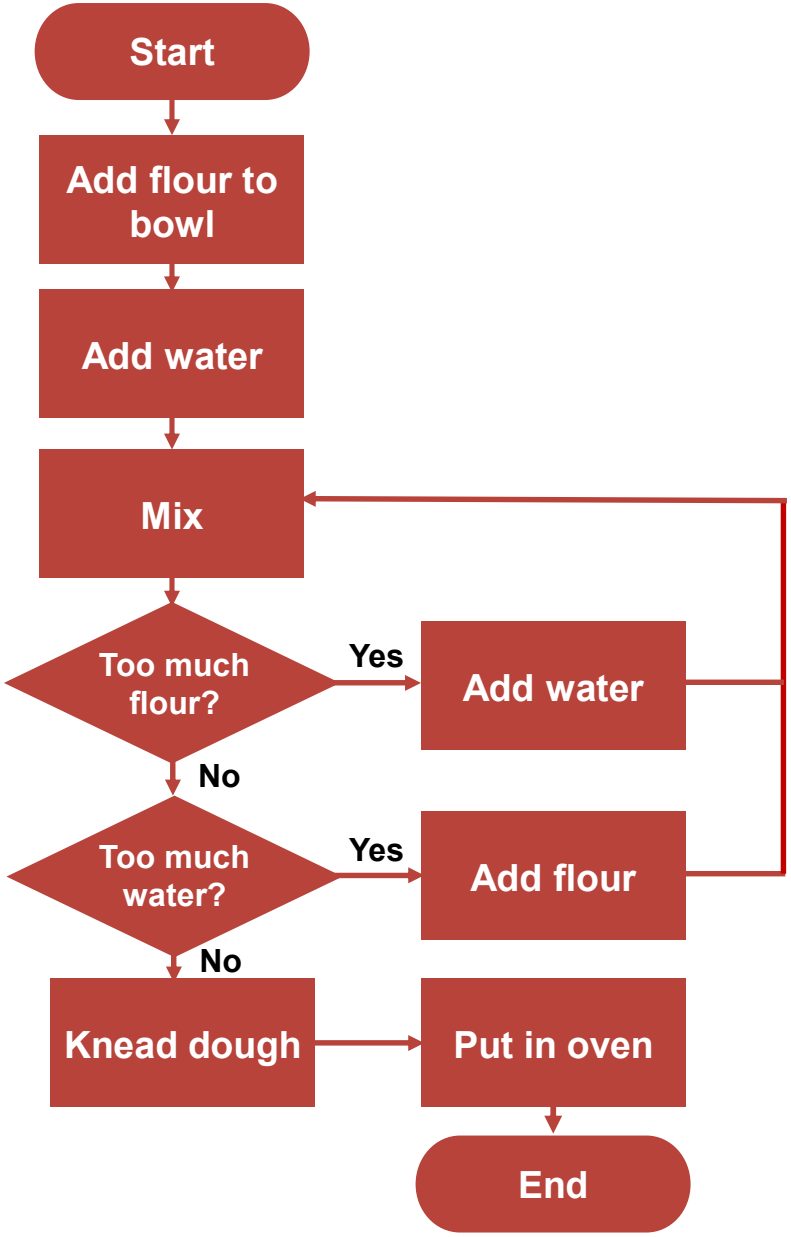
Starter

- Look at the flowchart
  - What is it a flowchart for?
  - Explain how the algorithm works



Starter

- It is a flowchart for making bread
  - The flour and water are mixed together
  - If there is too much flour, more water is added
  - If there is too much water, more flour is added
  - Once correct, the dough is kneaded
  - The dough is put in the oven



Arithmetic operators

Symbol	Description	Example
+	Add	5+7 = 12
-	Subtract	5-7 = -2
/	Divide	15/10 = 1.5
*	Multiply	5*7 = 35
^	Exponent	5^2 = 25
MOD	Modulo (Remainder)	17 MOD 3 = 2
DIV	Integer division	17 DIV 3 = 5

Using arithmetic operators

- What is assigned to x after each of the following operations?

  x = (4 + 3) * 6

  x = (10^2) / 4

  x = 20 – 8 * 2

  x = ((5 * 7) + 3) / 4

  x = 23 MOD 5

  x = 23 DIV 5

  x = ((3^2) * 4 + 7) DIV 4

Using arithmetic operators

Answers

- What is assigned to x after each of the following operations?

x = (4 + 3) * 6	42
x = (10^2) / 4	25
x = 20 − 8 * 2	4 ***(remember BIDMAS)***
x = ((5 * 7) + 3) / 4	9.5
x = 23 MOD 5	3 ***(4 r 3 discard the integer)***
x = 23 DIV 5	4 ***(4 r 3 discard the remainder)***
x = ((3^2) * 4 + 7) DIV 4	10

What is a variable?

- A variable is a **location in memory** in which you can **temporarily store a value such as a string or number**
  - It is used like an empty box
- You can choose a name for the box – this is called a 'variable name'
  - What you store in the box can be changed while the program is running

Variables

- When you write a statement such as

```
total = mark1 + mark2
```

- `total`, `mark1` and `mark2` are variables and you are assigning a value to `total`
- When you write a statement such as

```
total = total + mark3
```

you are saying:

- "Add the value in the location called `mark3`, to the value in the location called `total`"

What is an algorithm?

- We use ‘algorithms’ every day without even being aware of it
- Have you ever
  - made a cup of tea?
  - followed directions to a destination?
  - taken part in a school play?

An algorithm for a computer

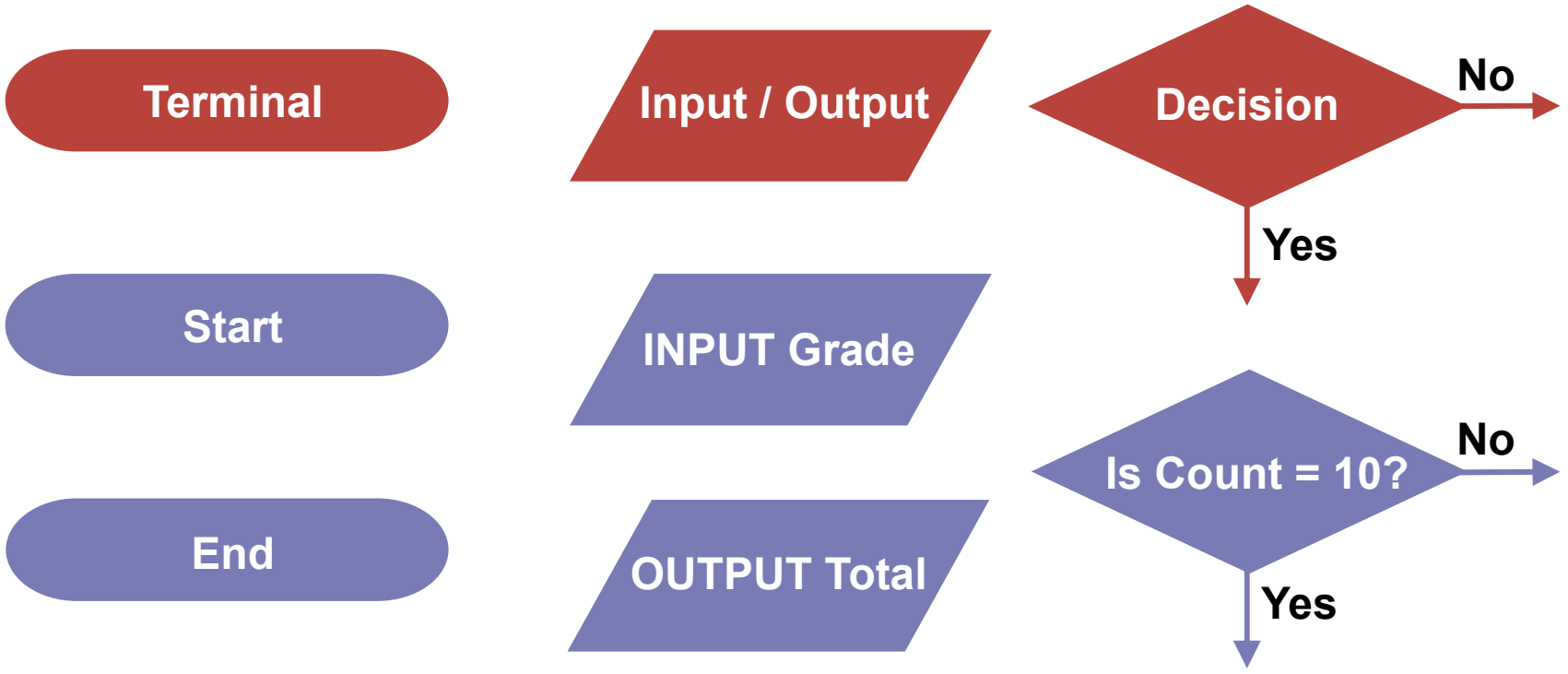
- Imagine programming a self-driving car…
  - What could possibly go wrong?

Writing algorithms

- An algorithm is a series of steps to solve a problem or carry out a task
- There are two common ‘tools’ to help plan and write down the steps needed:
  - Flowcharts
  - Pseudocode
- How many different flowchart symbols do you know?

Start

Flowchart symbols



Flowchart symbols

Line
Shows direction of flow

Process

Sub program

count = count + 1

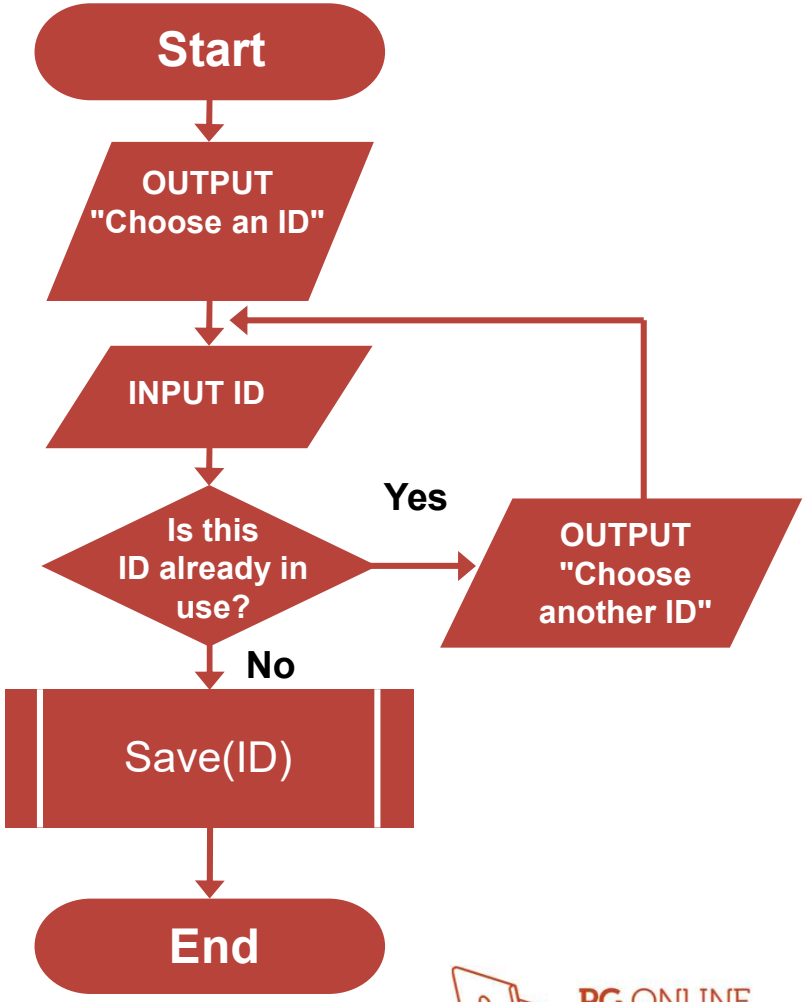
showMenu()

total = total + mark

search("Jack")

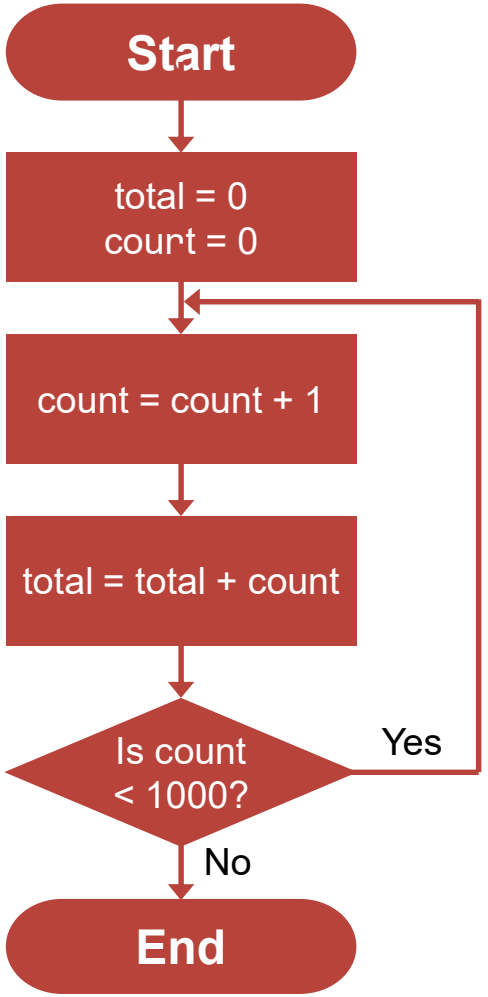
Drawing a flowchart

- An algorithm is a series of steps to solve a problem or carry out a task
  - What algorithm does this flowchart represent?



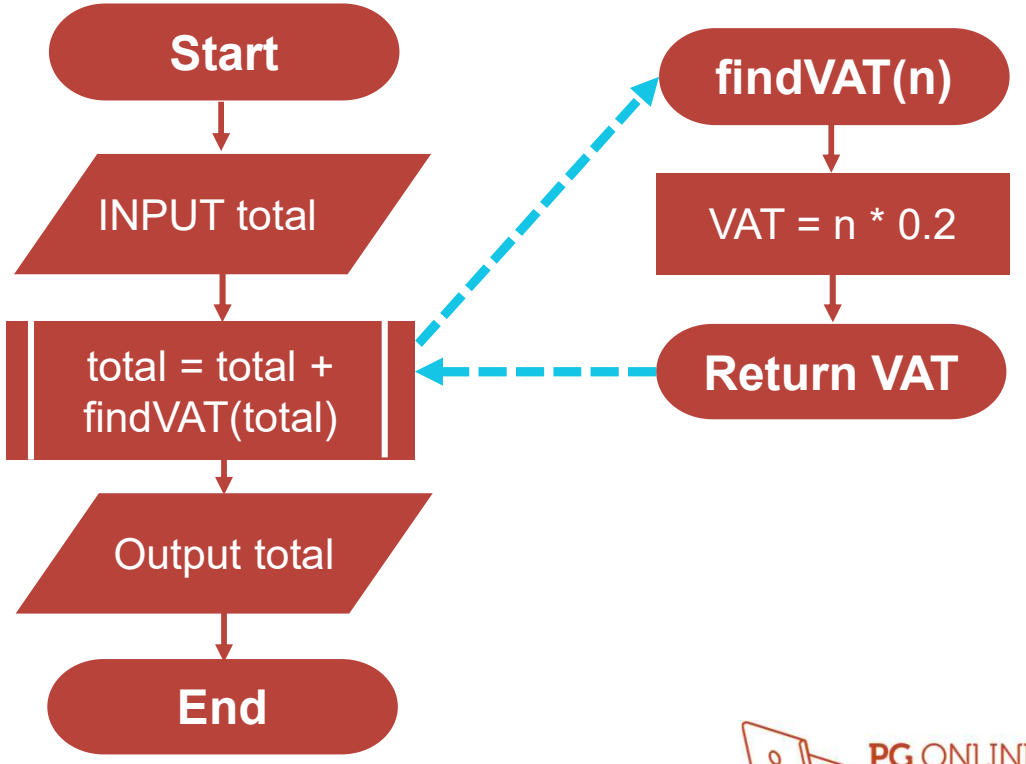
Counting and totalling

- The statement count = count + 1 means “Add 1 to the variable called count”



Sub programs

- Sub programs are used when you wish to call another procedure or function
  - They use a box with lines either side
  - In this example, findVAT is called from the sub program box
  - The findVAT sub program then runs and returns the answer to where it was called



Worksheet 4

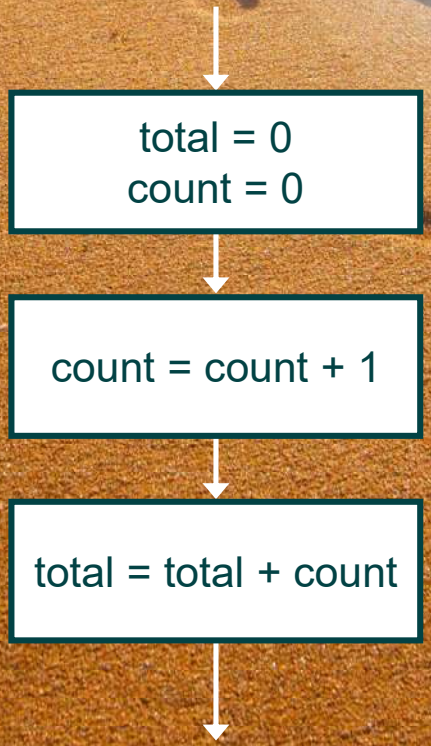
- Now complete **Task 1** and **Task 2** on **Worksheet 4**

Program structures

- There are three basic programming constructs used to control the flow of a program:
  - Sequence
  - Selection
  - Iteration (repetition)

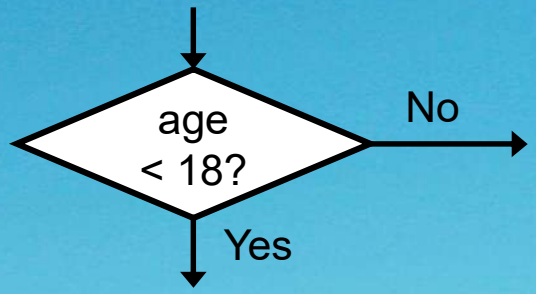
Sequence

- A sequence is a series of steps which are completed one after the other
  - In a flow diagram they are shown as process, input or output symbols shown one after the other



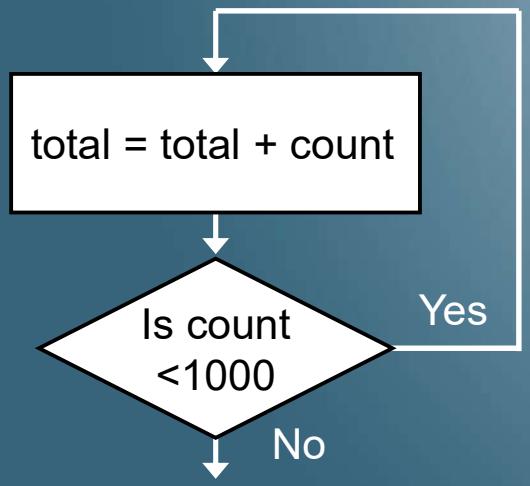
Selection

- Selection is the ability to choose different paths through a program
  - In flowcharts, decision symbols are used for selection



Iteration

- Iteration means repeating a part of a program
  - It is also referred to as repeating or looping
  - In flowcharts, iteration is shown by using arrows that repeat a section of the flowchart
  - A decision will control whether more iterations are required

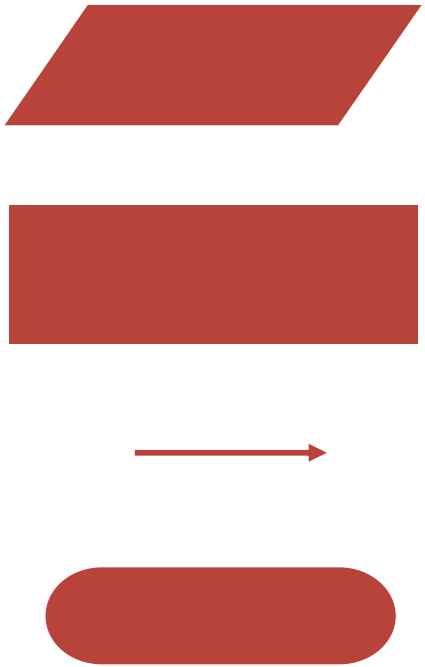


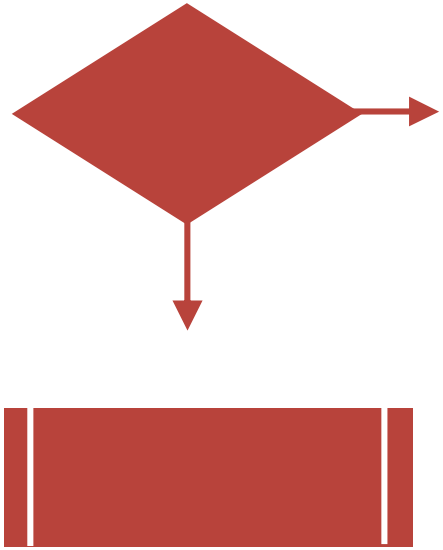
Worksheet 4

- Now complete **Task 3**, **Task 4** and **Task 5** on **Worksheet 4**

Plenary

- What are each of the following symbols?
  - Explain to a partner what each one does





Plenary

Answers

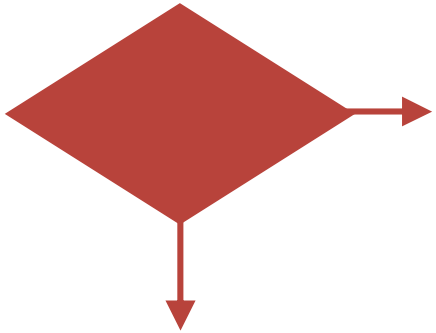
- What are each of the following symbols?
  - Explain to a partner what each one does

Input / Output

Process – Maths operations and assignment of variables

Line – shows direction of flow

Terminal – for start and stop



Decision – change flow based on a decision

Sub program – call a different function or procedure

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