

GCSE OCR

Computer Science
J277

4

Developing algorithms using flowcharts

Unit 6
Algorithms



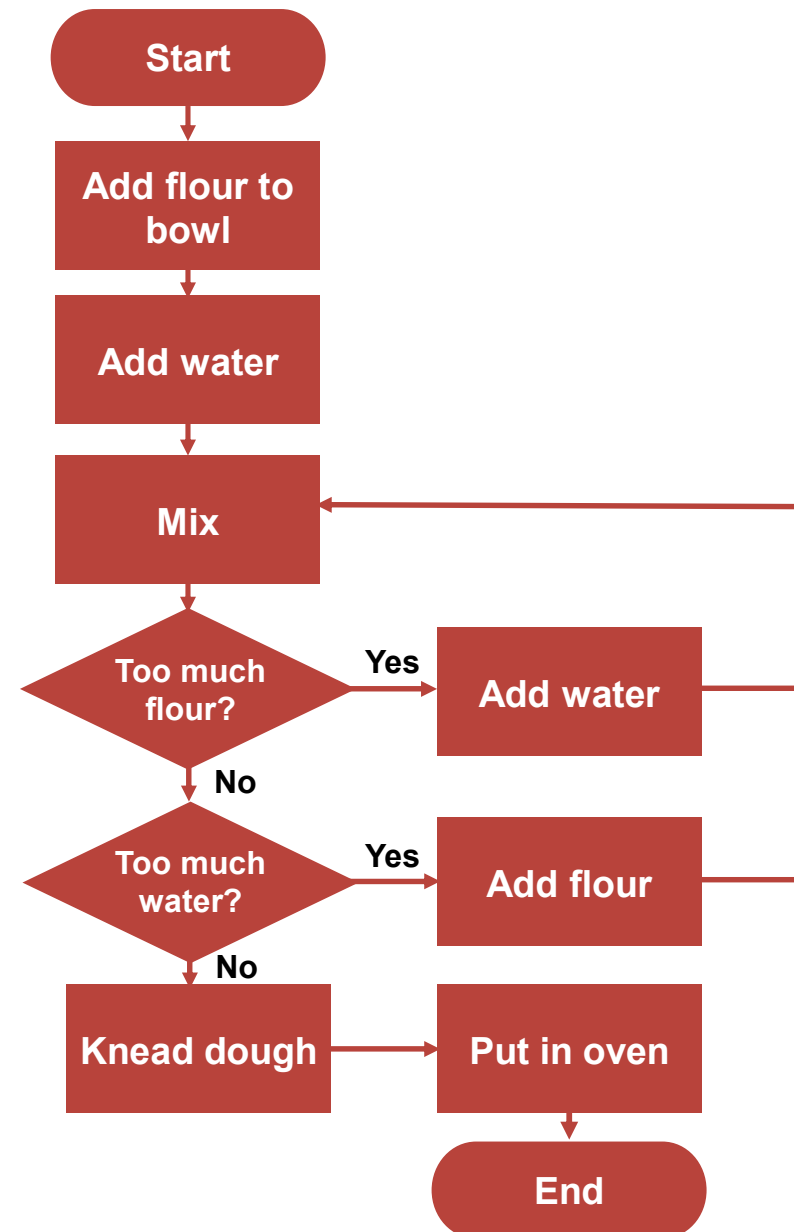
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Objectives

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

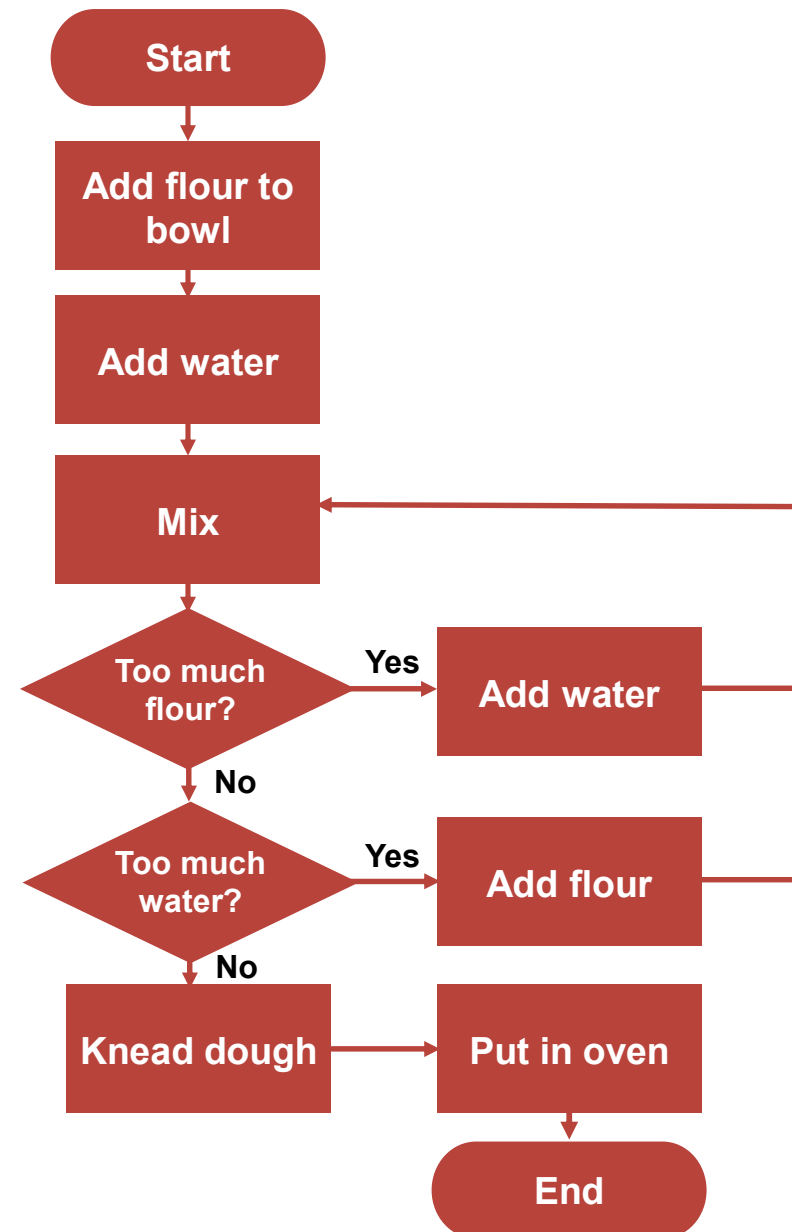
Starter

- 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)	$17 \text{ MOD } 3 = 2$
DIV	Integer division	$17 \text{ DIV } 3 = 5$

Using arithmetic operators

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

$$x = (4 + 3) * 6$$

$$x = (10^2) / 4$$

$$x = 20 - 8 * 2$$

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

$$x = 23 \text{ MOD } 5$$

$$x = 23 \text{ DIV } 5$$

$$x = ((3^2) * 4 + 7) \text{ DIV } 4$$

Using arithmetic operators

Answers

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

$$x = (4 + 3) * 6 \quad 42$$

$$x = (10^2) / 4 \quad 25$$

$$x = 20 - 8 * 2 \quad 4 \text{ (remember BIDMAS)}$$

$$x = ((5 * 7) + 3) / 4 \quad 9.5$$

$$x = 23 \text{ MOD } 5 \quad 3 \text{ (4 r 3 discard the integer)}$$

$$x = 23 \text{ DIV } 5 \quad 4 \text{ (4 r 3 discard the remainder)}$$

$$x = ((3^2) * 4 + 7) \text{ DIV } 4 \quad 10$$



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?

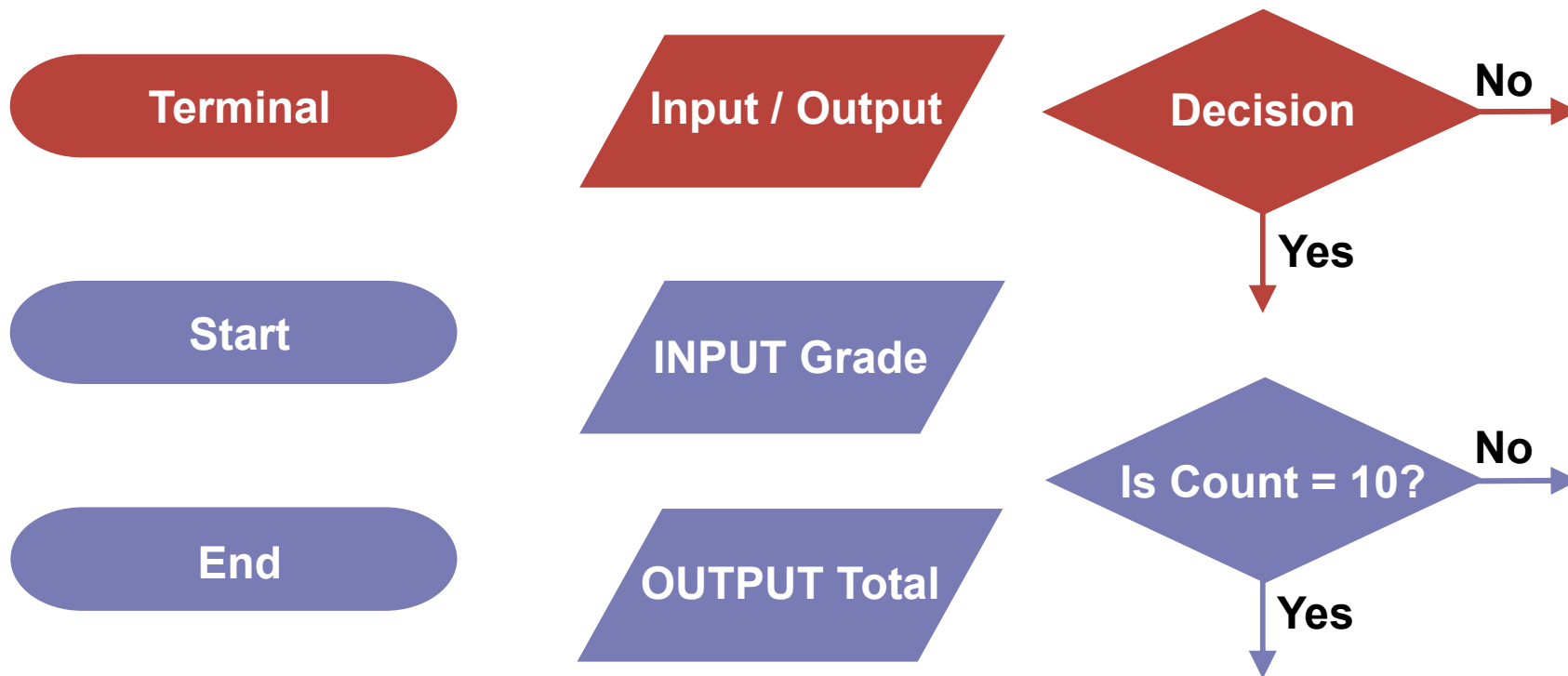


Writing algorithms

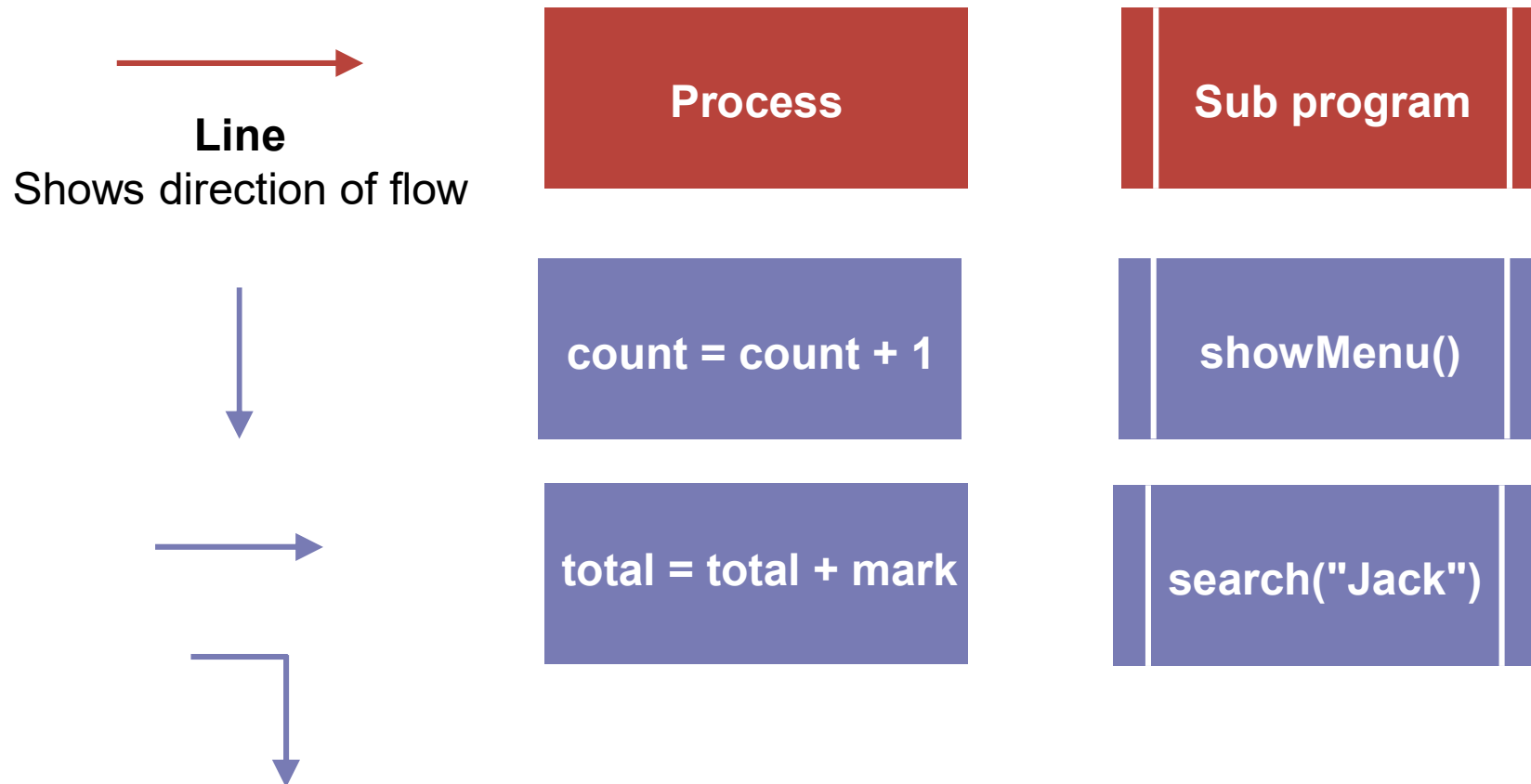
- An algorithm is a series of steps to solve a problem or carry out a task
- There are two common ‘tools’ to help plan and write down the steps needed:
 - Flowcharts
 - Pseudocode
- How many different flowchart symbols do you know?

Start

Flowchart symbols

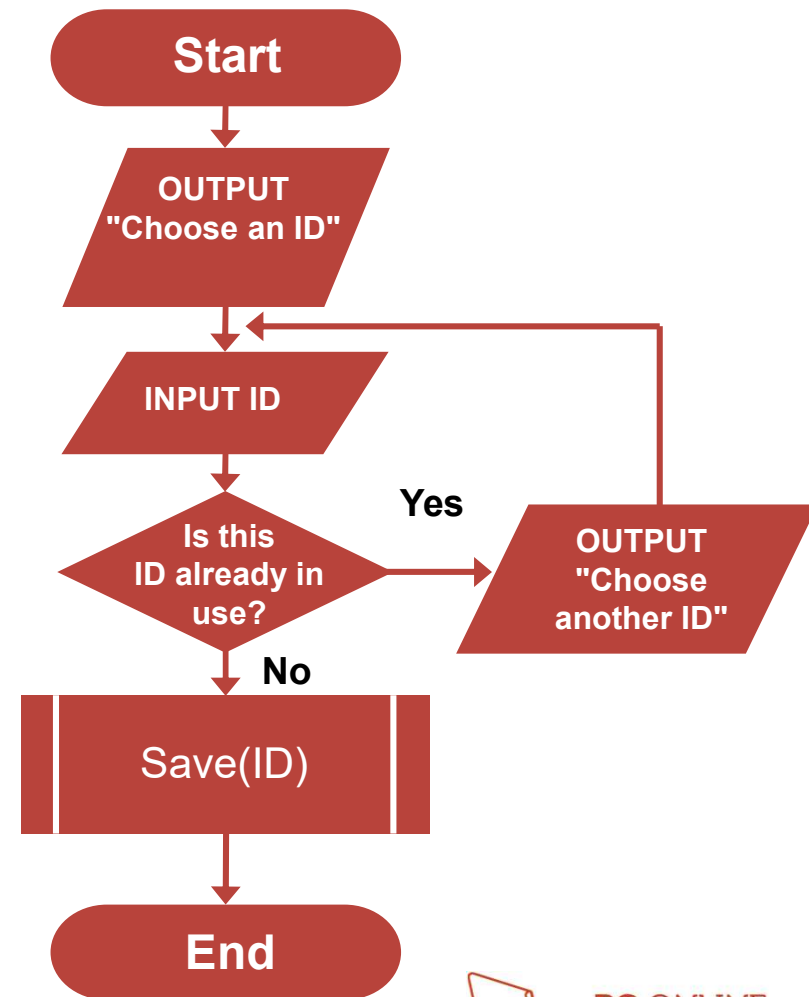


Flowchart symbols



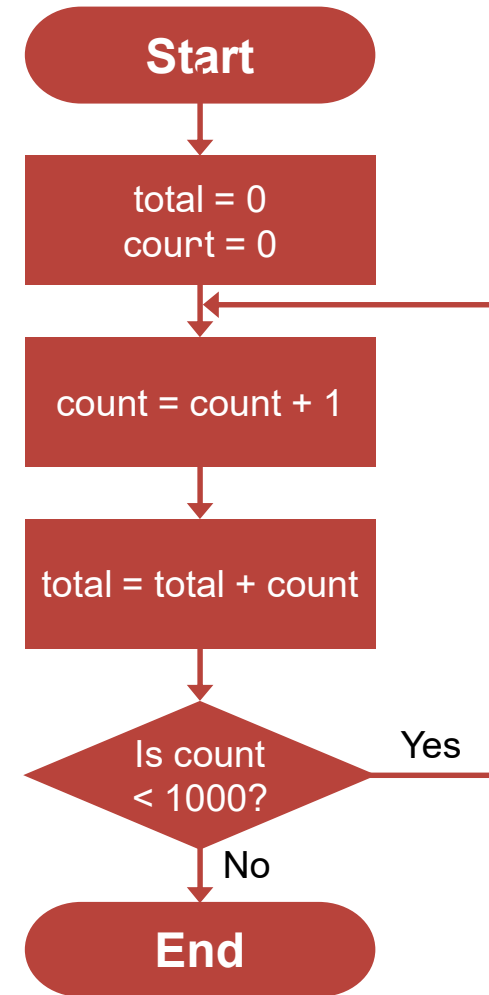
Drawing a flowchart

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



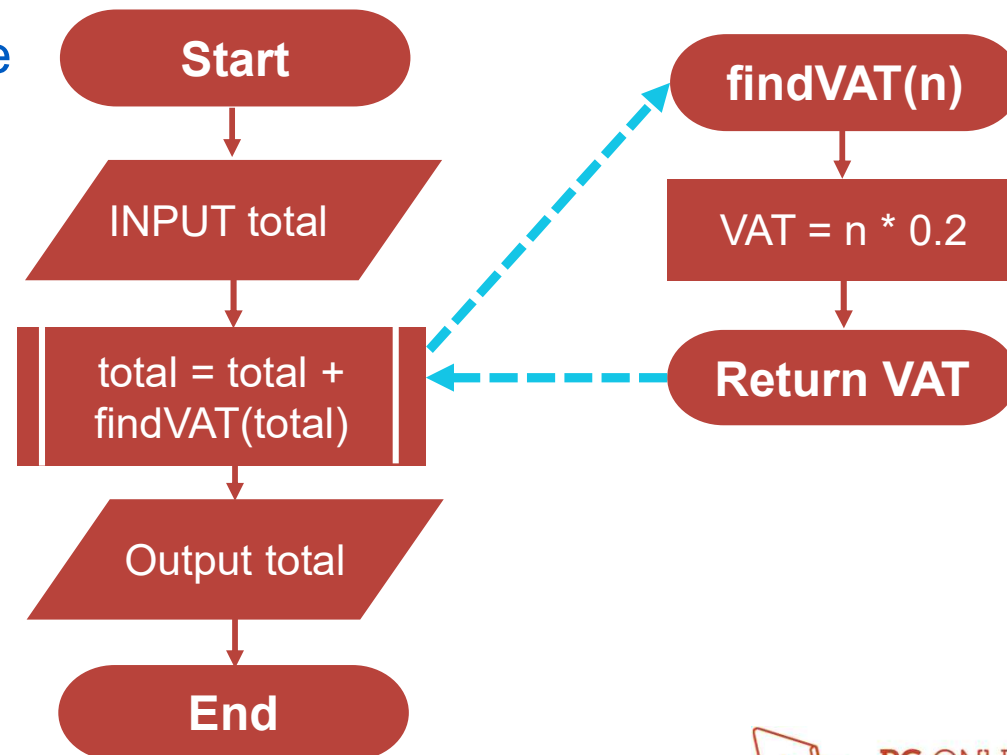
Counting and totalling

- The statement $\text{count} = \text{count} + 1$ means “Add 1 to the variable called count ”



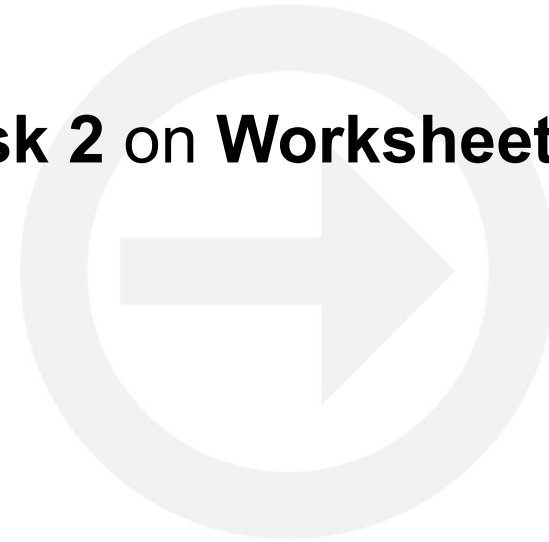
Sub programs

- 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**

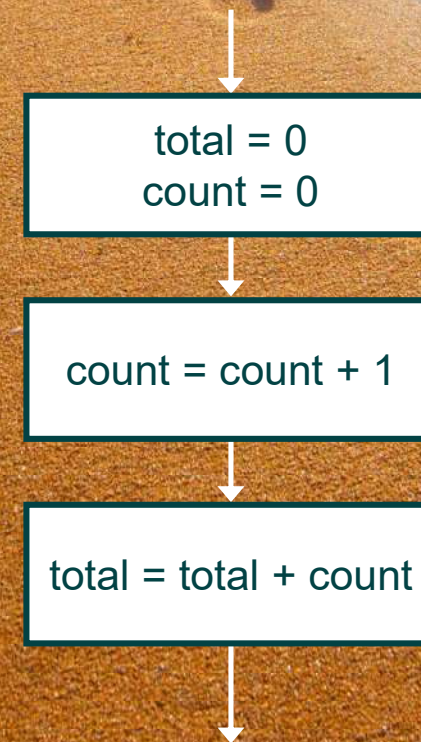


Program structures

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

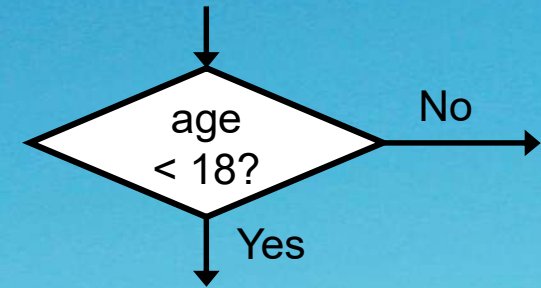
Sequence

- 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



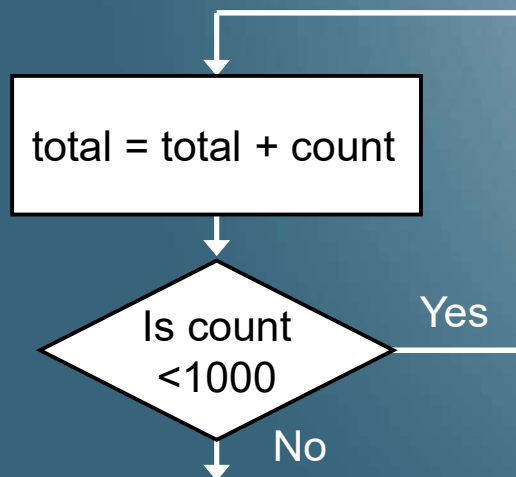
Selection

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



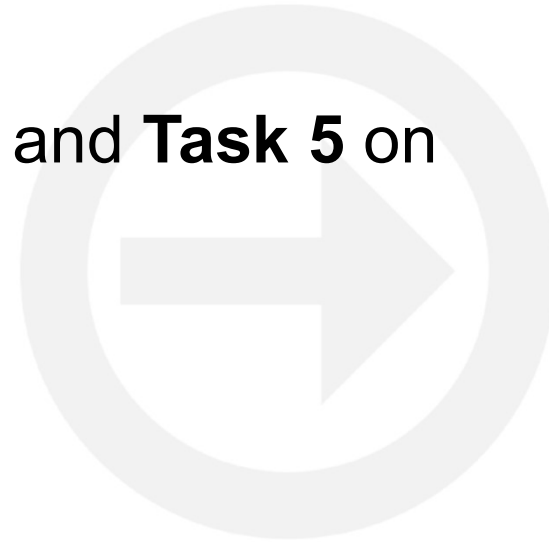
Iteration

- 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



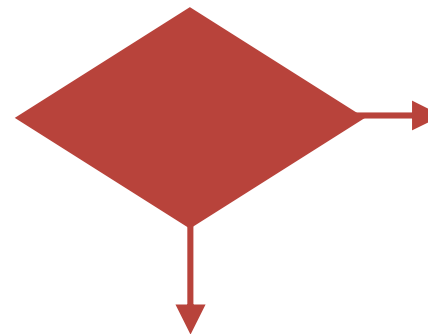
Worksheet 4

- 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



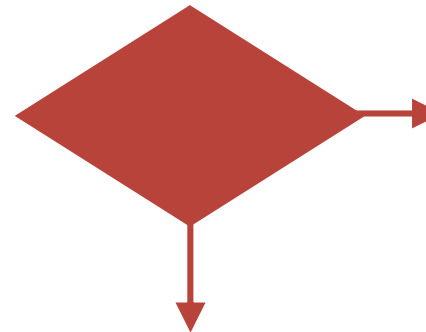
Process – Maths operations and assignment of variables



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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