



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David



Week 3

Trawsnewid Addysg; Trawsnewid Bywydau
Transforming Education; Transforming Lives



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Today's Lecture

- Variables
- Pseudocode
- Flowchart

Assessment 1(written exam)

- Q1 will assess the skill and ability to evaluate a problem and formulate requirements and constraints via IPO charts (marks 20).
- Q2 will assess ability to identify and create variables with their data types from the IPO charts (marks 15).
- Q3 will assess analysing the problem and producing logical solution for it via writing a pseudocode and providing program output (marks 20).
- Q4 will assess ability to interpret variable values in a pseudocode via trace tables (marks 20).
- Q5 will assess graphical illustration of the logical solutions proposed in a pseudocode via flowcharts (marks 25).

Instructions

- Equipment or materials required – None
- The Candidates are not permitted to bring dictionaries; textbooks/case studies or any other reference materials into the exam room.
- The Candidates are only permitted to use calculators.
- Show all your calculations in your exam book
- Answer all five questions

Question 1 – IPO charts (20 marks)

What is expected?

Input Identification - identifies all necessary inputs and describes them accurately.

Process Description - describes all processing steps with clear and explanations.

Output Specification - specifies all outputs and describes them accurately

Question 1

a) Create a IPO chart that will help a shop to calculate the total cost in a "20% off for purchases over £100" promotion. It should prompt for the prices of items being purchased by the customer. The program will then calculate the total cost before discount, determine if the discount applies, and display the final cost to pay. Complete an IPO Chart for the problem.

Input	Processes	Output

Question 1 - Sample solution

Input	Process	Output
Prices of items being purchased	1. Prompt for the prices of items being purchased by the customer.	Total cost before discount
	2. Calculate the total cost before discount by summing up the prices of the items.	Determine if discount applies
	3. Determine if the total cost is over £100.	Final cost to pay
	4. If total cost is over £100, apply a 20% discount.	
	5. Calculate the final cost after applying the discount (if applicable).	
	6. Display the final cost to pay.	

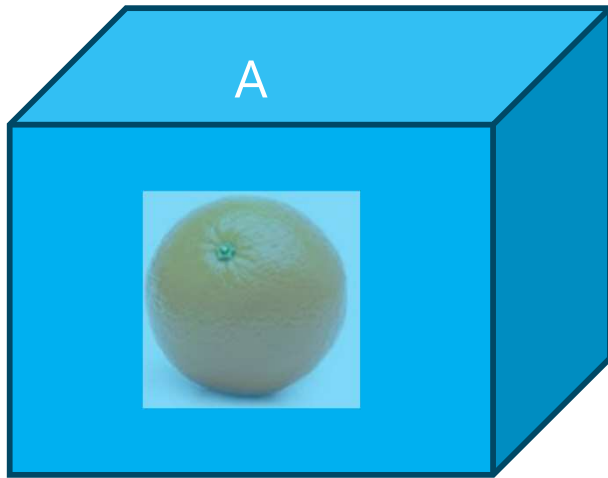
VARIABLES



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Variables



$A = 1 \text{ Orange}$



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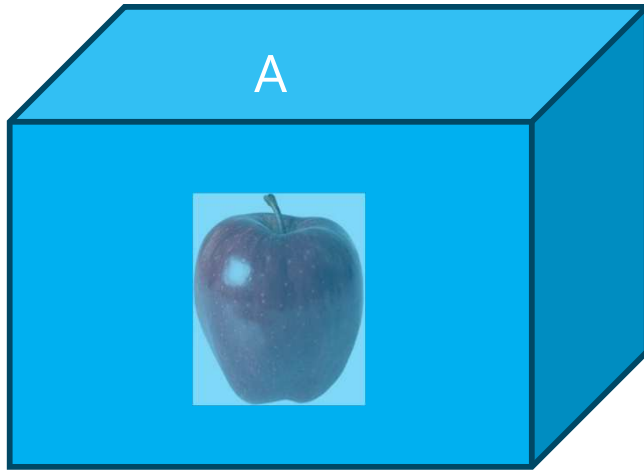
Variables

A = 1 Orange

Box has a location in the shelf



Variables



$A = 1 \text{ Apple}$

Variables

A = 1 Apple

Box has the same location in the shelf



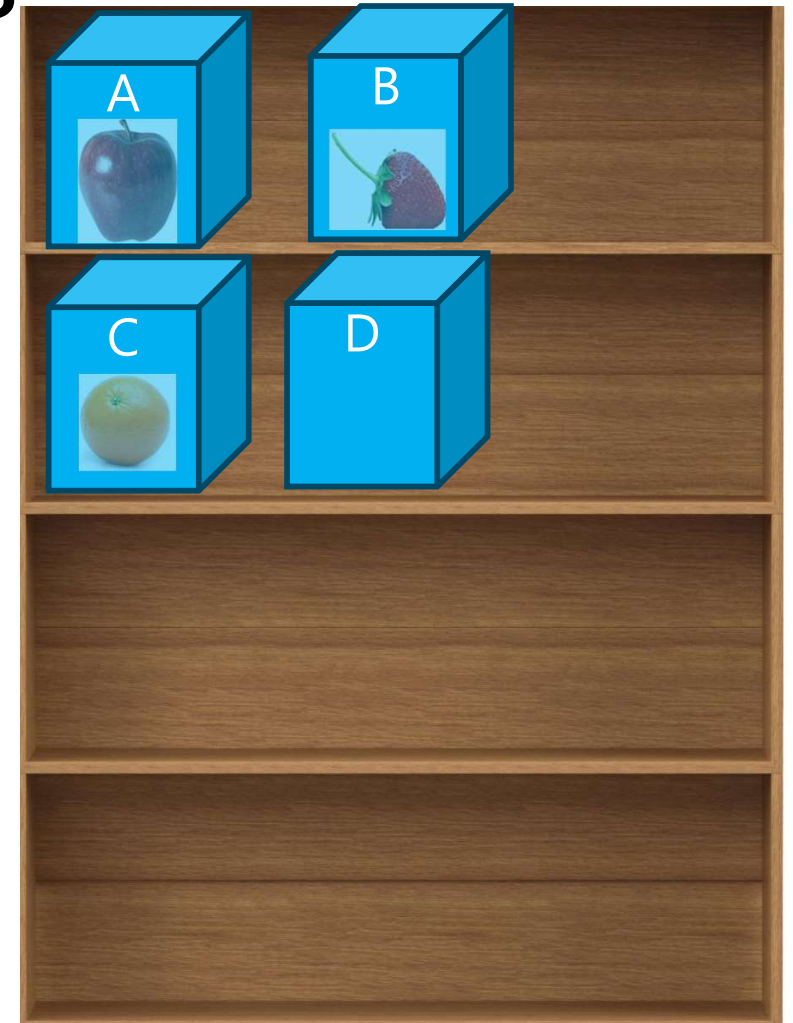
Variables

- Just as you needed a way to represent an item so you could easily identify it/recall it later, computers also do the same thing.
- Variables are used to represent ***values that need to be used later in a program.***
- The value is stored in a variable in the computer's memory so that it can easily locate that value when needed.
- Think of a variable as a **name given to** a value, object or item in a computer problem solution.

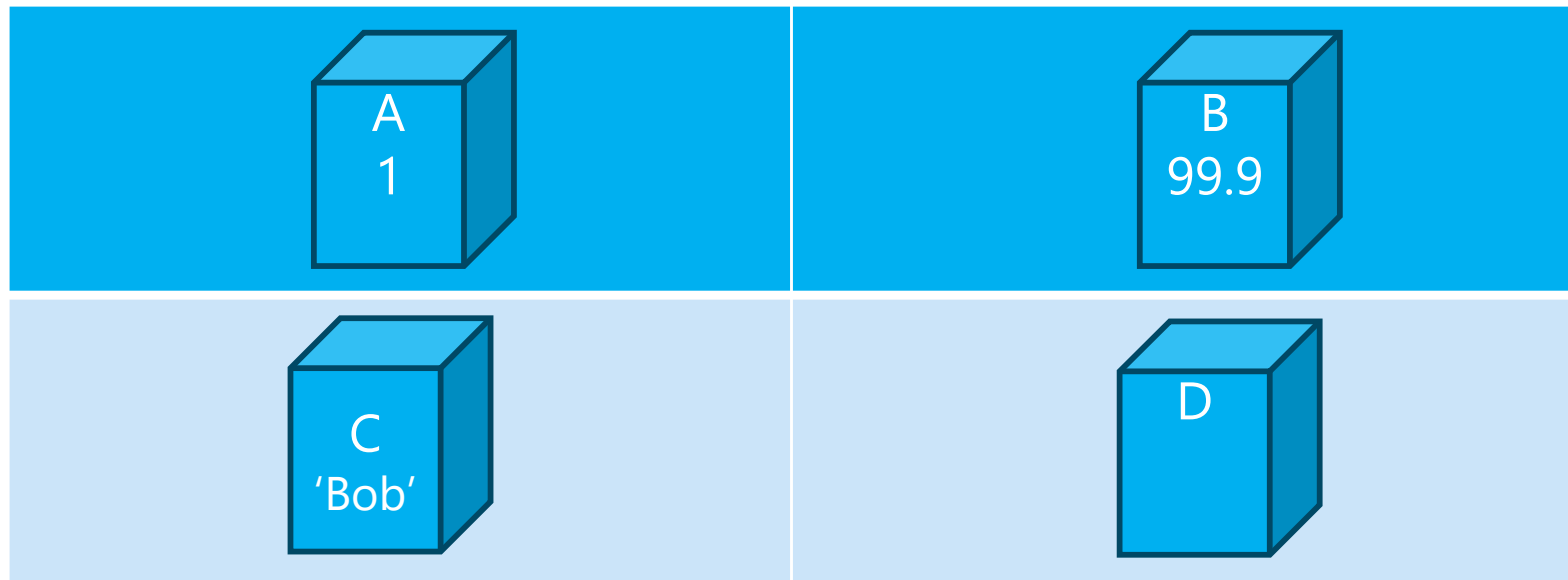
Variables

A = 1 Apple

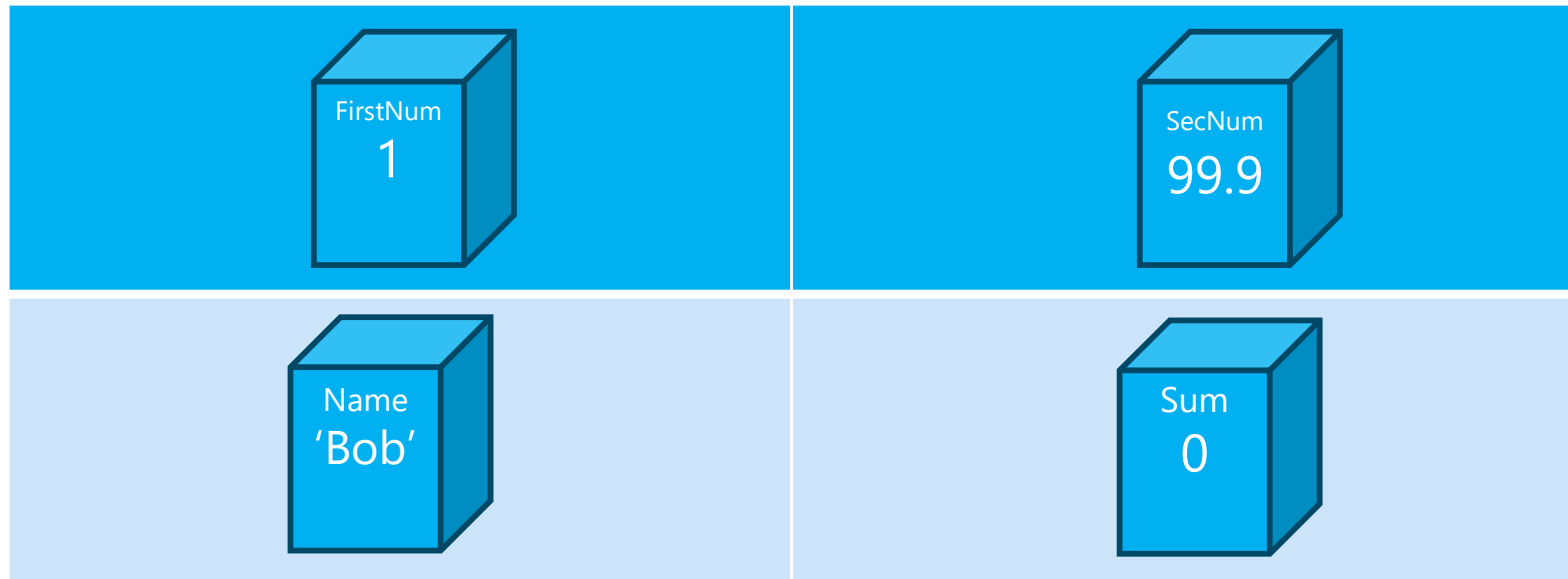
Box has the same location in the shelf



Variables



Variables



FirstNum = 1
SecNum = 99.9
Sum = 0
Name = 'Bob'

Variables

- Your inputs and outputs are good examples of values that need to be remembered and stored in variables.
- Inputs need to be remembered to be used in some process e.g. a calculation.
- Outputs need to be remembered so that they can be displayed to the user.
 - **Note:** some outputs can be directly displayed without needing to store them in a variable.
 - It is mostly outputs that are involved in some calculation or process that get stored in a variable first.

Variable Names

- Even though we are not programming 😊, we will still follow the rules for specifying variables.
- As mentioned previously, variables are names to identify values or items that need to be remembered.
- Variable names:
 - Must be one word (**no spaces!**)
 - No punctuation characters (.,!'", + etc.) ✖
 - Some languages allow hyphens (-) and underscore (_)
 - The first character cannot be a number, but others can.
 - The name should be **meaningful** and related to what it represents.

Exercise: Variable Names

- Using the rules on the previous slide, which of the following is not an acceptable variable name:
 1. One_name
 2. M
 3. 1_Name
 4. TheFirstName

Exercise: Variable Names

- Which of the following is not an acceptable variable name:
 1. My Friend
 2. Your_Friend
 3. We_Are_All_Friends
 4. all of the above are acceptable variable names

Knowledge Check: Variable Names

Question 1: Which of the following is not an acceptable variable name?

- a) myVariable
- b) user_name
- c) 2ndPlace
- d) total_amount

Knowledge Check: Variable Names

Question 2: Which of the following variable names is acceptable?

- a) user@name
- b) first{name
- c) Total\$Amount
- d) lastName

Knowledge Check: Variable Names

Question 3: Which of the following is a valid variable name?

- a) @count
- b) count@123
- c) count_One23
- d) Count£123

Knowledge Check: Variable Names

Question 4: Select the invalid variable name:

- a) Name_1
- b) ^userID
- c) totalAmount
- d) nameFirst

^ → Caret symbol (exponentiation operator)-

Example : $2 \wedge 5 \rightarrow 2^5$

Knowledge Check: Variable Names

Question 5: Which of the following variable names is not allowed?

- a) firstName
- b) age!
- c) last_name
- d) UserID

Knowledge Check: Variable Names

Question 6: Which of the following is an invalid variable name?

- a) First_Name
- b) FirstName1
- c) 1stName
- d) FirstName

Knowledge Check: Variable Names

Question 7: Choose the correct variable name:

- a) total amount
- b) total_amount
- c) total.amount
- d) total+amount

Knowledge Check: Variable Names

Question 8: Identify the valid variable name:

- a) \$total
- b) total_amount!
- c) totalAmount
- d) total%Amount

Knowledge Check: Variable Names

Question 9: Which variable name is valid?

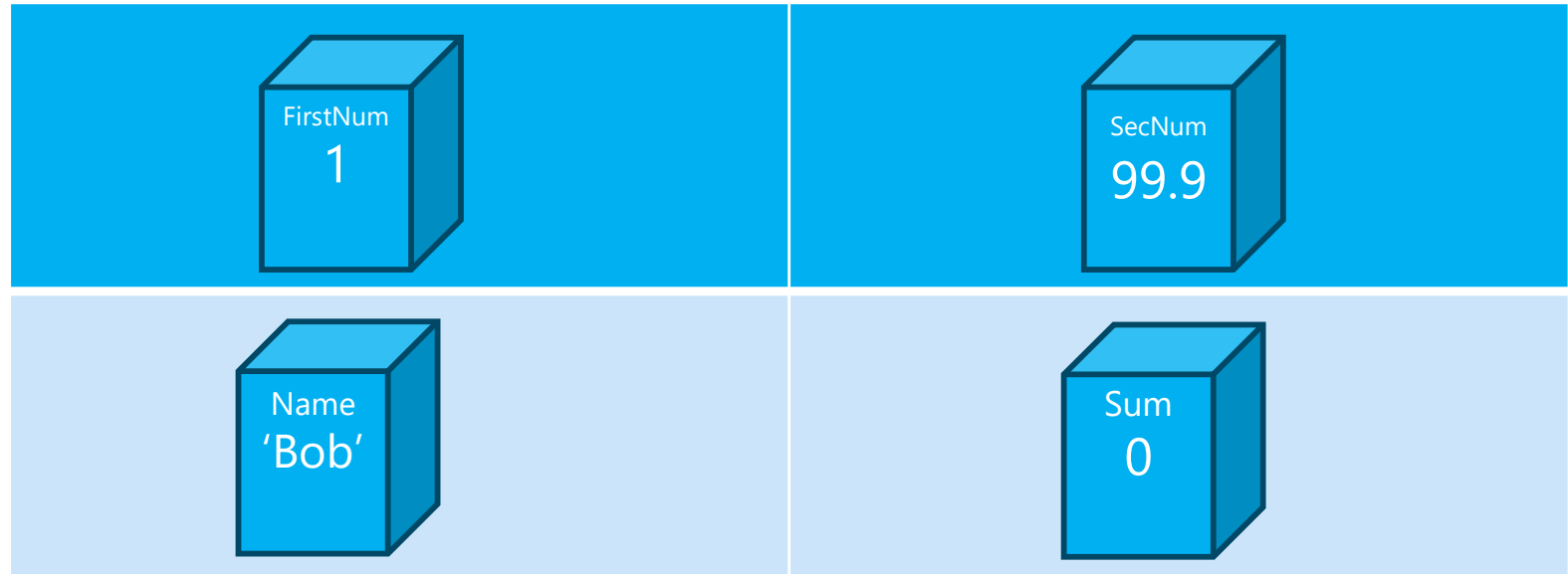
- a) user.name
- b) user_name
- c) user-name
- d) user name

Knowledge Check: Variable Names

Question 10: Which of the following is an invalid variable name?

- a) toAmount
- b) totalAmount123
- c) 123TotalAmount
- d) totalAmount

Variables



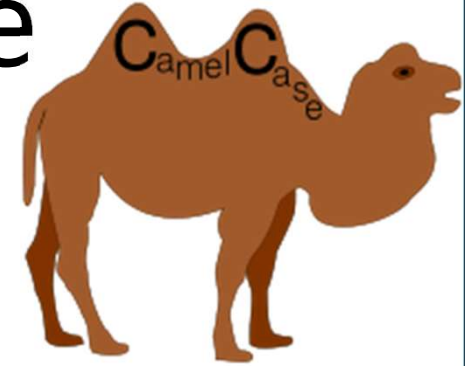
```
FirstNum = 1
SecNum =
99.9
Sum = 0
Name = 'Bob'
```

```
Sum = FirstNum + SecNum
Display Sum
```

```
Display FirstNum + SecNum
```



Variable Names: Camel Case



- Remember, variable names must be one word and cannot contain spaces.
- Thus, a common practice is to use:
 - A **C**apital letter to denote the start of a new word when combining words to make a variable name.
 - The first word is usually started with a small letter.

*This is known as **camel case** – camel**C**ase.*

- Think of the humps on a camel's back
- The Capitalised letters in the middle of the words represent the humps.

Variable Names: Pascal Case & Others

- Pascal case is an alternative common practice used when naming variables.
 - A **C**apital letter is used to denote the start of all new words when combining words to make a variable name.
 - This is known as Pascal Case or Upper Camel Case – **P**ascal**C**ase or **U**pper**C**amel**C**ase.
- Some people also use underscores to separate multiple words e.g. pascal_case or upper_camel_case
- You can use any format, but **be consistent!**

Variables: Example

- Referring to our tip calculator from the last exercise:
Create a simple tip calculator. It should prompt for a bill amount and a tip rate (percentage). The calculator will then calculate the tip amount and display both the tip amount and the final, total bill amount.
- Identify the required variables:

Variables: Example

- Referring to our tip calculator from the last exercise:
Create a simple tip calculator. It should prompt for a bill amount and a tip rate (percentage). The calculator will then calculate the tip amount and display both the tip amount and the final, total bill amount.
- We may come up with the following variables:

Camel Case

- ❑ billAmount
- ❑ tipRate
- ❑ tipAmount
- ❑ totalBillAmount

Pascal Case

- ❑ BillAmount
- ❑ TipRate
- ❑ TipAmount
- ❑ TotalBillAmount

Variable Types

What variables will you use for the following problem?

You have been asked for a calculator for a shop to calculate the total bill price after applying the standard VAT rate, 20%, to the price of the items purchased.



<https://forms.office.com/e/aPnssEGjXU>

Variable Types

What variables will you use for the following problem?

You have been asked for a calculator for a shop to calculate the total bill price after applying the standard VAT rate, 20%, to the price of the items purchased.

- itemPrices
- totalPrice
- vatRate
- vatAmount
- totalBill

<https://forms.office.com/e/aPnssEGjXU>



Variable Types

- Variables can be constant, that is, their values do not change.
- Such variables are called **Constants**, because their values remain constant (do not change).
- In the previous example, the **vatRate** variable will be an example of a constant.
 - Its value is always 20%.
- Variables whose values change or have values that are not predefined (e.g. based on input) are simply known as **Variables**.

Variable Types

- In programming, it is also common to distinguish variable types based on the type of data they store.
- For example:
 - Text variables
 - Number variables
 - True/False variables
 - Collections and Groups of things
 - Loads more.
- We will not ***really*** be doing this in this module.

Exercise: Variables and Constants

The Music Purchase Program

- You have been asked to provide a solution to:
Create a calculator for a website that allows users to download music tracks at a cost of 0.99p. The user simply enters how many music tracks they wish to download and it calculates the total price.
- What will be the variables and constant(s), if any, for this solution?

Exercise: Variables and Constants

- You have been asked to provide a solution to:
 - Calculate the total price for a user to pay on checking out the items in their shopping basket.
 - The total price should include:
 - The sum of all items, but assume that the VAT rate has been included as part of an item price.
 - The delivery charge which is a flat rate of £3.99.
 - The shop has also promoted a discount code called DISC10, which has a value of 10%, which shoppers may apply.
- What will be the variables and constant(s) for this solution?

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