Learning Aims

Learn about the use of variables, constants, operators, inputs, outputs and data types

To be able to debug programs and fix syntax errors

Test your programs using a range of inputs

3 Main Programming Constructs

Sequence – step by step instructions

Selection – To make decisions in a program

Iteration – Looping instructions

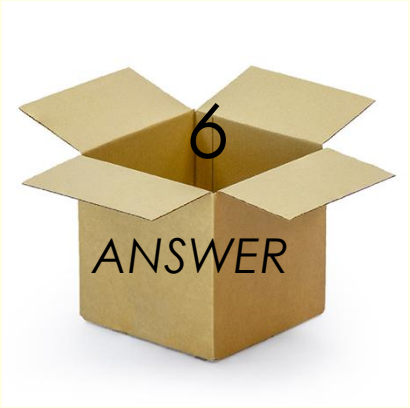
Outputs

```
print("hello world")

name = "Ada Lovelace"

print("hello" + " " + name)

answer = 10 * 2

print("Answer =",answer)
```

How does a computer store inputs?

- In programming, inputs and data are stored in something called a variable.
- It can simply be thought of as a storage box.
- Technically though, it is a reference to a memory location where the data is to be stored.
- The variable must be given a name, and it can hold a single data item

Variable called 'answer'



Contents is anything we type in

answer = 6

Variable key terms

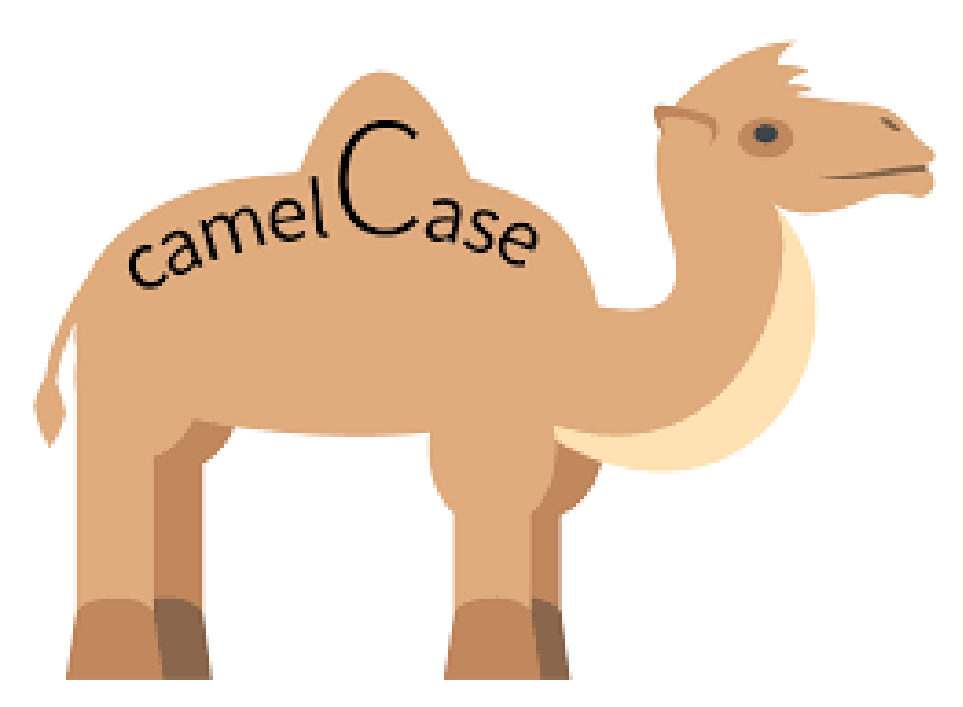
```
firstname = input("Enter your firstname: ")
print("Hi", firstname)
```

Identifier

Assignment

Variables - Use **Camel case**

count	bigList	countAnimalTypes	isValidCounter()



Variable Rules

- Always use meaningful variable names so it is easy for other programmers to understand your code.
- Never start a variable with a number
- Keep it short
- Spaces not allowed
- use camelCase for example: carType

Definitions: Variables and constants

A variable is used to store a value in a program

- points to a memory location
- and the value be changed (while the program is running)
- you can assign a value to a variable at **run-time**

A constant is used to store a value in a program

- points to a memory location
- the value of a constant cannot be changed once the program is running/can only be set at **design time.**

Constants

Constants are identifiers that are set only once in the lifetime of the program.

Write constant names in **CAPITAL LETTERS** to distinguish them from variables

Assign values to constants at the **start of the program** and ensure that these values are not changed during execution of the entire program.

TAX = 0.175	CORNERS = 4	TITLE = str () TITLE = "Accounts"	MAXCOUNT = 34

Data Types

There are several different types of data that your programs will need to work with.

Here are some of them:

String

This data type describes any combination of characters (letters, numbers & symbols)

Integer

This is any whole number. If the computer knows the data is an integer it can carry out calculations on the data

Real / Float

This type describes any decimal (fractional) number

Character

This data type describes any single character (that you might find on a keyboard, for example).

Boolean

This data type has just two values: True & False.

Data types and conversion

This table shows examples of variable declarations that allocate memory, based on the size of the data type indicated.

Data type	**Explanation**	**Example**	**Description**
integer	A whole number (negative or positive)	count = 0	An integer variable initialised to 0
string	Text	name = "David"	A string variable initialised to David
float	A number with a decimal (negative or positive)	TAX = 0.175	A real constant initialised to 0.175
Boolean	Data that can only have one of two values, either true or false	windowOpen = True	A Boolean variable initialised to True
character	A single letter, number, symbol, etc., usually available from the keyboard	myInitial = "J"	A character variable initialised to "J"

Here is an example of conversion known as casting:

count = int (input ("Enter a number"))

Here is another example of conversion:

balance = float (count)

Selecting data types

Here are some rules for choosing data types:

Field	Data type
Does the data contain a single letter or symbol?	CHAR
Does the data contain letters or symbols?	STRING
Does the data contain only whole numbers?	INTEGER
Does the data contain only numbers and a decimal point?	REAL
Can the data only be “True” or “False”?	BOOLEAN
Does the data start with a zero?	STRING
Does the data include spaces?	STRING

Example – variable assignment

These are examples of values being assigned to variables:

counter = 0	assigns the value 0 to the counter variable
lives = 3	assigns the value 5 to lives variable
score = lives * 3	assigns 3 times the number of lives to score
counter = counter + 1	adds 1 to the previous value of counter
gamertag = "cryptic gangster"	assigns the value 12N to the class variable
gameOver = True	assigns the Boolean value True when game over

Mathematical Operators

+ Addition

- Subtraction

* Multiplication

/ Division

// Division that returns a whole number (DIV)

** Exponent (to the power)

% Modulus - returns the remainder (MOD)

Converting data types (Casting)

- When asking for an input the value will always be a string:

```
num = input()
```

- To do a calculation the num has to be converted to an integer:

```
calculation = int(num) * 2
```

- Calculation will need to be converted back to a string if you print like this:

```
print("Answer" + str(calculation)
```

- However not if I do this

```
print("Answer", calculation)
```