

Introduction to Programming in Turing

Output of Information

The IPO Model

The most basic model for a computer system is the Input-Processing-Output (IPO) Model.

In order to interact with the computer as a programmer, we must develop simple examples of each of these stages, which we will then build upon to solve more and more sophisticated problems.

Output

The most fundamental operation of a computer program is to communicate something useful to the end user.

We accomplish this with the concept of Output. Output is implemented in many ways depending upon the programming language.

For example: `put`, `print`, `printf`, `puts`

Using the “put” Command

In the Turing programming language, output is accomplished using the “put” command.

To start, we will consider outputting the most basic types of data – strings (which are groups of characters), and integers (whole number values).

Output in Turing

Whenever we refer to a string in Turing (and most other languages, and pseudocode), we need to put the characters in quotation marks:

```
put "Hello!"  
put "Hello world!"
```

For integers, no quotation marks are needed. Turing recognizes that they are numbers.

```
put 35
```

Mathematical Operations in Turing

To actually make use of the computer's calculating ability, we need to use some mathematical operators.

Operator	Operation	Code
+	Add	$A + B$
-	Subtract	$A - B$
*	Multiply	$A * B$
/	Divide	A / B
**	Exponent	$A ** B$

Math using Turing

put 3 + 5	output is 8
put 4 - 11	output is -7
put 2 * 6	output is 12
put 7 / 2	output is 3.5

Remember that Order of Operations (BEDMAS) applies to what you are doing. You can use brackets to ensure calculations are done in the order you want.

Example: Using Brackets for Order of Operations

$$\frac{3+4}{2-5} + \frac{11 \times 6}{2^3}$$

```
put (3 + 4) / (2 - 5) + (11 * 6) / (2**3)
```