Propositions are Boolean statements that can either be true or false. When on their own, they are called **Atomic** propositions. Examples include;

‘It will rain today’

and

‘I will bring an umbrella’.

Both statements are either **True** or **False**, represented by the values of 1 or 0 respectively.

Going further, we can string Atomic Propositions together to form **Complex** Propositions.

As with our previous examples;

‘It will rain today *and* I will bring an umbrella’.

Replacing our Atomic Propositions with the variables ‘p’ & ‘q’, we get;

p *and* q

When both p and q are true, the result of the overall statement will be true. However, if either p or q are false, the overall statement will be false.

Below displays the various permutations of our Complex Proposition. We will use the output value to decide whether or not we will go out.

|  |  |  |
| --- | --- | --- |
| **It will rain today** | **I will bring an umbrella** | **I will go out** |
| False | False | False |
| False | True | False |
| True | False | False |
| True | True | True |

As we can see, it is only when *It is raining* and *We have an umbrella* that we go out. This is because of the connective ‘*and’* statement*.* If we instead used an *OR* connector, our truth table would look like this.

‘It is raining’ or ‘I will bring an umbrella’

p *or* q

|  |  |  |
| --- | --- | --- |
| **It will rain today** | **I will bring an umbrella** | **I will go out** |
| False | False | False |
| False | True | True |
| True | False | True |
| True | True | True |

As can be seen, we will go out when either of the two statements are true. Only when both are false will we not go out.

Though computers may appear to think, this basic idea of propositions is what drives any ‘thought’. It is a mathematical approach to decision-making and abstracts the decision into its basic components. By introducing even more Complex propositions, we may produce outputs that appear more ‘thoughtful’, or not logical. However, being logic based, propositions always have a logical output; The same input will create the same result every time. As is seen in the prior propositions, we appear to make a judgment based on the current weather and if we have an umbrella, and to an extent we do, however we do not consider how much it will rain, or if the umbrella is broken. We only consider two inputs, and our resulting output is constant with the same input.