

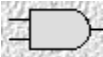




The AND Gate

1. Open the program **LogicSim**.

2. Drag two **switches**  from the palette on the left hand side of the screen. You may need to use the selector tool  to move the switches into the right position.



3. Drag the **AND** gate  from the palette to the right of the switches. Select the **LED** button  (LED stands for Light Emitting Diode – basically a light) and drag it to the right of the AND gate. Your circuit should look like this – use the selector tool  to move objects around if it doesn't.



4. Each component can be labelled by selecting the component and then choosing **Component Name** from the **Circuit Menu (or Apple H)**. Label your circuit as shown below.



A



AND

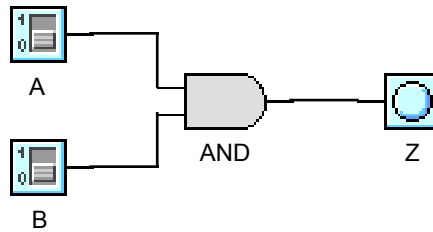


Z



B

5. The different components can be wired together by pressing the **option** key while using the mouse. When a circle appears on the connection the mouse can be used wire it to another component. The wires can be straightened by holding the **Shift** key down and using the mouse to stretch the wires from the middle. Wire up the circuit as shown in the diagram below.



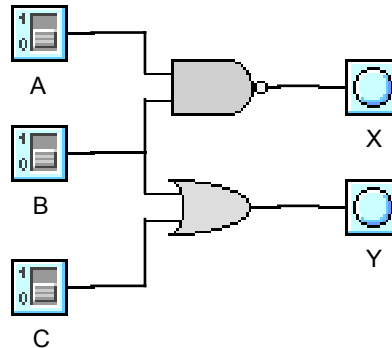
6. Save the circuit naming it **AND**.
7. To switch power on, select **Run** from the simulation menu. The circuit should now change to an all yellow background. You should be able to click on the switches and experiment with what would happen when different combinations of switches are pressed.
8. It is important that you document what happens when the switches are ON (called 1 in binary) and OFF (called 0 in binary). The LED (Z) is the output of the AND gate. Complete the table below (called a **Truth Table**) by using your circuit to calculate what happens.

X	Y	Z
0	0	
0	1	
1	0	
1	1	

9. In your own words, describe how the **AND** gate works

Combination Circuit 1

1. Open the program called LogicSim and construct the circuit shown below. Make sure that the switches and LED's are labelled as shown below. Save the circuit as **CC1**.



2. Test the circuit and complete the truth table below. Make sure all possible combinations of switches are tested.

A	B	C	X	Y
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

3. What combinations turn the **X LED** on?

4. What combinations turn the **Y LED** on?

5. Is it possible to have both the **X** and **Y** LED on at the same time? Explain how?

6. In your own words describe the purpose of this circuit?

Circuit Design 2

1. Study the following truth table

Input			Output	
A	B	C	X	Y
0	0	0	0	0
0	0	1	0	0
0	1	0	1	0
0	1	1	1	1
1	0	0	1	0
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

2. When is **X** on (has the value 1)? _____

3. When is **X** off (has the value 0)? _____

4. When is **Y** on (has the value 1)? _____

5. When is **Y** off (has the value 0)? _____

6. Sketch out a circuit on this sheet that would produce the truth table above.

Sketch your circuit design here