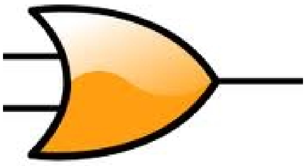
Name___________

Logic Gates Worksheet – Truth Tables

Label these basic logic gates and fill in their truth tables.

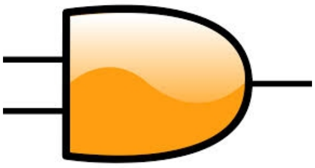
gate



This gate takes two inputs and gives an output if either one input or the other input or both inputs are true

Input A	Input B	Output
0	0	
0	1	
1	0	
1	1	

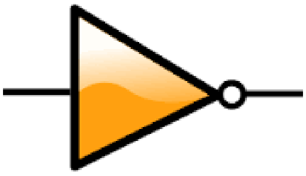
gate



This gate takes takes two inputs and gives an output only if both inputs are true

Input A	Input B	Output
0	0	
0	1	

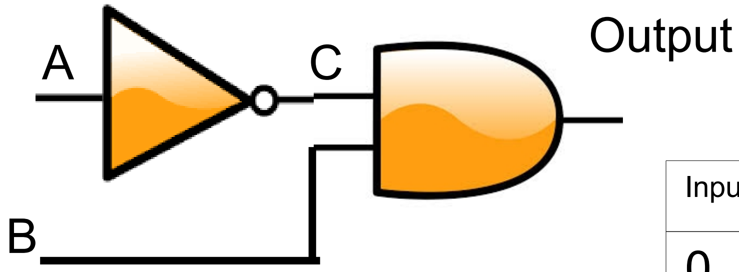
gate



This gate takes one input and gives an output that is the opposite value to the input

Input	Output
0	
1	

For this combination of two logic gates, fill in the truth table. Point C is used to help you work out the output.



Input A	Input B	C	Output
0	0		
0	1		
1	0		
1	1		

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Draw your own combination of two logic gates and a completed truth table. Use the logic lab at http://www.neuroproductions.be/logic-lab/ to test your predictions.

Input A	Input B	C	Output
0	0		
0	1		
1	0		
1	1		

Draw your own combination of logic gates that will give this truth table output. Use the logic lab at http://www.neuroproductions.be/logic-lab/ to test your predictions.

Input A	Input B	C	Output
0	0		1
0	1		1
1	0		1
1	1		0

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Binary → Denary Conversions Worksheet

- To convert from binary to denary we just need to be able to add....
- Start by writing the column names above the binary digits remembering they start at one on the right hand side and double as you move to the left.
- Then add up the values of the columns with a 1.

For example:

128	64	32	16	8	4	2	1
0	1	1	0	1	1	0	1

$$\begin{array}{r} 64 \\ 32 \\ 8 \\ 4 \\ \underline{+\ 1} \\ \underline{109} \end{array}$$

Now it's your turn:

128	64	32	16	8	4	2	1
1	1	0	0	0	1	1	0

0	0	1	1	1	0	1	0

1	0	0	1	1	0	1	1

1	0	1	1	0	1	1	0

0	0	1	0	0	1	0	1

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Denary → Binary Conversions Worksheet

- To convert from denary to binary we just need to be able to subtract....
- Start by writing the column names above where your binary digits will go, remembering they start at one on the right hand side and double as you move to the left.
- Then start from the left and see if you can take the value above the column away from your denary number. If you can, enter a 1 in that column and move right.

For example: Starting with a denary value of 209

128	64	32	16	8	4	2	1
1	1	0	1	0	0	0	1

$$\begin{array}{r} 209 \\ \underline{-128} \\ 81 \end{array} \quad \begin{array}{r} 81 \\ \underline{-64} \\ 17 \end{array} \qquad\qquad \begin{array}{r} 17 \\ \underline{-16} \\ 1 \end{array} \qquad\qquad\qquad \begin{array}{r} 1 \\ \underline{-1} \\ 0 \end{array}$$

Now it's your turn: Convert **164** to binary

128	64	32	16	8	4	2	1

Convert **243** to binary

Convert **71** to binary

Convert 2**55** to binary

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Binary Addition Worksheet

- To add binary we just need to remember a few rules:
  - 0 + 0 = 0
  - 0 + 1 = 1 or 1 + 0 = 1
  - 1 + 1 = 10 (0 carry 1 left) 1 + 1 + 1 = 11 (1 and carry 1 left)

For example:

```
  0 0     0 1     0 1     0 1     0 0 0 1     0 1 0 1
+ 0 1   + 0 0   + 0 1   + 1 0   + 0 1 0 1   + 0 1 1 1
-----   -----   -----   -----   ---------   ---------
  0 1     0 1     1 0     1 1     0 1 1 0     1 1 0 0
-----   -----   -----   -----   ---------   ---------
           1                          1       1 1 1
```

Now it's your turn (don't forget, you can check by converting to denary):

```
  1 0     0 1     0 1 0 1     1 0 0 1     1 1 0 1
+ 0 1   + 1 0   + 0 1 0 1   + 0 1 1 0   + 0 0 0 1
-----   -----   ---------   ---------   ---------

_____   _____   _________   _________   _________
```

In computing we are often interested in **8 bit** numbers – we call these a **byte**

```
  1 0 0 1 0 0 1 0     1 0 0 1 0 0 1 1     1 0 0 0 0 0 1 0
+ 0 1 1 0 0 0 1 0   + 0 1 1 0 0 0 1 0   + 0 1 1 1 0 1 1 0
-----------------   -----------------   -----------------

_________________   _________________   _________________
```

Now try these. What do you notice?

```
  1 1 0 1 0 0 1 1     1 0 1 0 0 0 1 0
+ 0 1 1 0 0 0 1 0   + 0 1 1 1 0 1 1 0
-----------------   -----------------

_________________   _________________
```

The problem above is called an ___________________. It means that there are

more __________ than can be stored in a byte, or eight bit number.

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