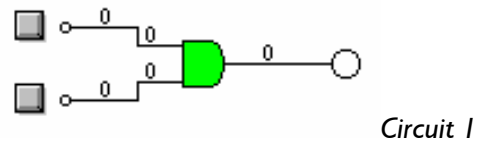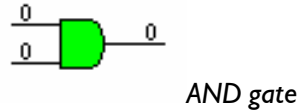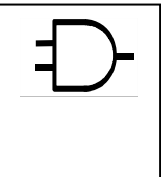# Discover the Truth (Table)

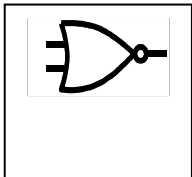**Objective:** Use Crocodile Physics to generate the truth tables for digital logic gates.

1. In Crocodile Physics, click on the NAND gate symbol on the electronics toolbar to open the Logic Gate toolbar.

    Logic Gate Toolbar

2. From the Logic Gate toolbar, drag the AND gate and place it near the top of the screen.

    AND gate

3. From the same toolbar, drag two logic switches and connect them to the inputs of the AND gate.

    Logic Switch

4. Next, drag a logic indicator into place and connect it to the output of the AND gate.

    Logic Indicator

5. Your circuit should look like Circuit 1 on the right. On the View menu, select Logic Signals. This will place a 1 or 0 at each input and output to assist you in interpreting the operation of the circuit.
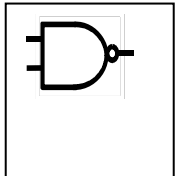
    Circuit 1

6. Set the switches to match the inputs on the first row of the truth table (A= 0, B= 0), and record the output as a 0 or 1in the X column beside the AND gate symbol. Then turn on one switch and record the output in the second line of the truth table. Repeat for the third line (A= 1, B=0) and the fourth line (both switches on). You now have the truth table for the AND gate. Repeat all the steps for each gate.

1.

A	B	X
0	0	
0	1	
1	0	
1	1	

2.

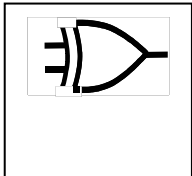| A	B	X
0	0	
0	1	
1	0	
1	1	

3.

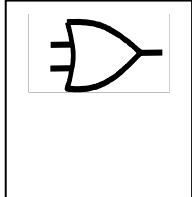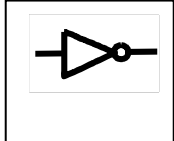| A	B	X
0	0	
0	1	
1	0	
1	1	

4.

A	B	X
0	0	
0	1	
1	0	
1	1	

5.

A	B	X
0	0	
0	1	
1	0	
1	1	

6.

A	X
0	
1	

Answer the following questions by referring to the truth tables you have created:

1. On the previous page, write the name of each gate below the symbol. (Hint: hold your mouse over the symbol on the toolbar.)

2. Fill in the blanks in the following statements:

    a. The output of the AND gate is true when _____ of the inputs are true.

    b. The output of the OR gate is true when _____ of the inputs are true.

    c. The output of the NAND gate is true when _____ of the inputs are true.

    d. The output of the NOR gate is true when _____ of the inputs are true.

    e. The output of the XOR gate is true when _____ of the inputs is true, but not both.

3. What is the difference between the truth table for AND and the truth table for NAND?

   _____

4. What is the difference between the truth table for OR and the truth table for NOR?

   _____

5. Despite the differences, there is a similarity between the truth tables for AND, OR, NAND and NOR; what do they have in common?

   _____

6. The exclusive OR gate (XOR) does not fit the pattern of the other gates; explain the difference between OR and XOR.

   _____

7. Look at the truth table for the inverter, and write a sentence in the same form as the examples in question 2 to describe the relationship between the input and output.

   _____