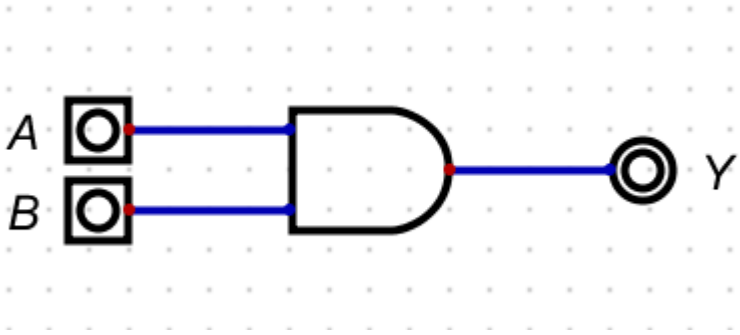
LOGIC GATES

Basic Logic Gates

```
These are the fundamental gates used in digital circuits:
```

1. AND Gate -

   Output is 1 only when all inputs are 1.



Truth table

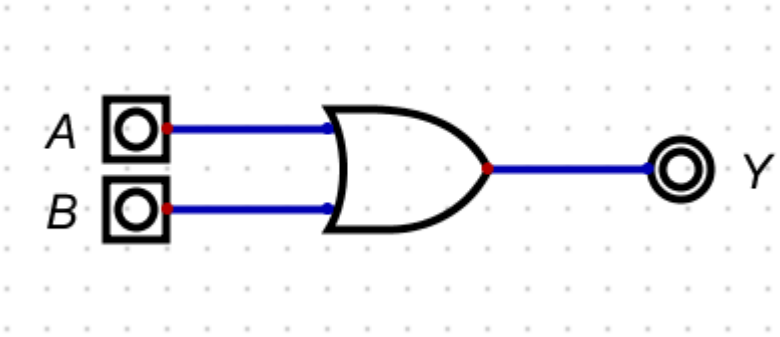
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

Timing diagram

```
{ "signal": [
  { "name": "A", "wave": "01.100110" },
  { "name": "B", "wave": "00.110011" },
  { "name": "Y", "wave": "00.100010" }
]}
```

2. OR Gate -

Output is 1 when at least one input is 1.



Truth table

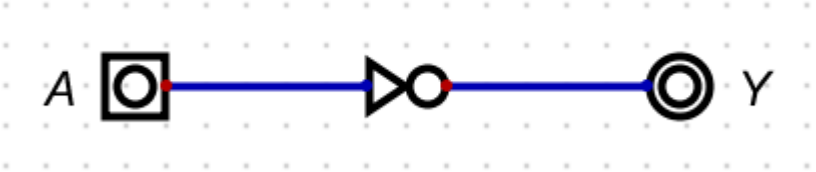
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

Timing diagram

```
{"signal": [
    {
        "name": "A",
        "wave": "10.001101"
    },
    {
        "name": "B",
        "wave": "10.101010"
    },
    {
        "name": "C",
        "wave": "10.101111"
    }
]}
```

3. NOT Gate -

It inverts the input: 0 becomes 1, and 1 becomes 0.



Truth table

A	Y
0	1
1	0

Timing diagram

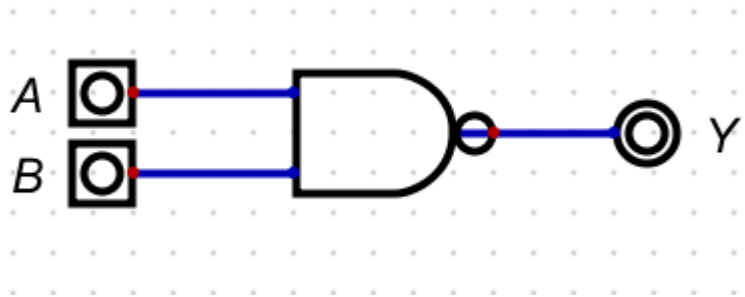
```
{ "signal": [
  { "name": "A", "wave": "01010101" },
  { "name": "Y",    "wave": "10101010" }
]}
```

Universal Logic Gates

```
These gates can be used to create any other logic gate:
```

1. NAND Gate -

   Output is 0 only when all inputs are 1.



Truth table

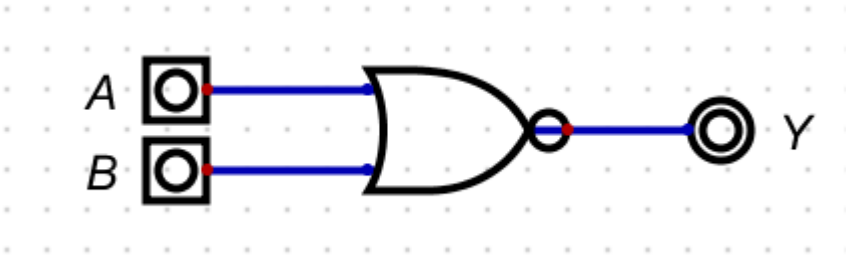
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

Timing diagram

```
{ "signal": [
  { "name": "A",   "wave": "01011010" },
  { "name": "B",   "wave": "01100110" },
  { "name": "Y ", "wave": "11101001" }
]}
```

2. NOR Gate -

   Output is 1 only when all inputs are 0.



Truth table

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

Timing diagram

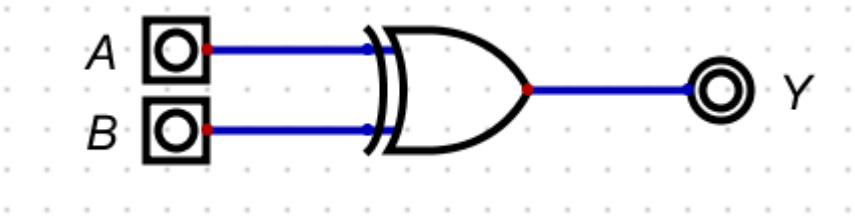
```
{ "signal": [
  { "name": "A", "wave": "01011010" },
  { "name": "B", "wave": "01100110" },
  { "name": "Y", "wave": "10000001" }
]}
```

> Exclusive Logic Gates

```
 These gates can be used to create any other logic gates:
```

1. XOR Gate -

Output is 1 if inputs are different.



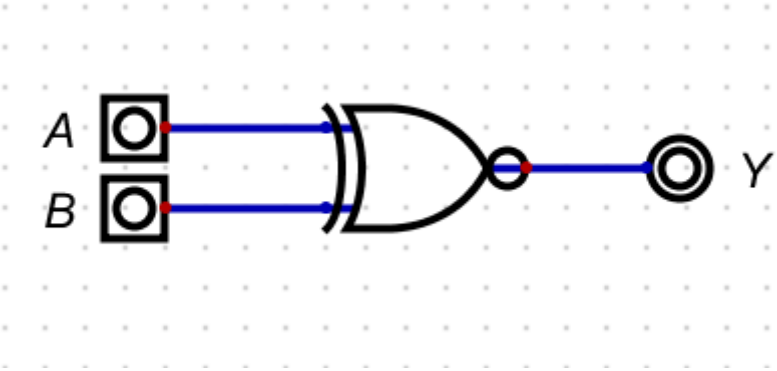
Truth table

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

Timing diagram

```
{ "signal": [
  { "name": "A", "wave": "01011010" },
  { "name": "B", "wave": "01100110" },
  { "name": "Y", "wave": "00111101" }
]}
```

2. XNOR Gate -



Output is 1 if inputs are the same.

Truth table

A	B	Y
0	0	1
0	1	0
1	0	0

A	B	Y
1	1	1

Timing diagram

```
{ "signal": [
  { "name": "A", "wave": "01011010" },
  { "name": "B", "wave": "01100110" },
  { "name": "Y", "wave": "11000010" }
]}
```