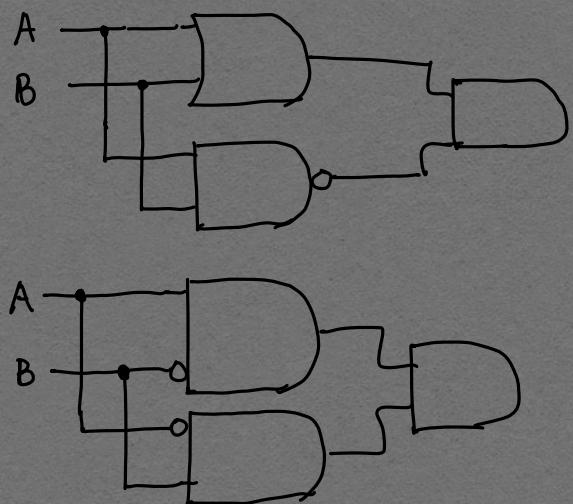
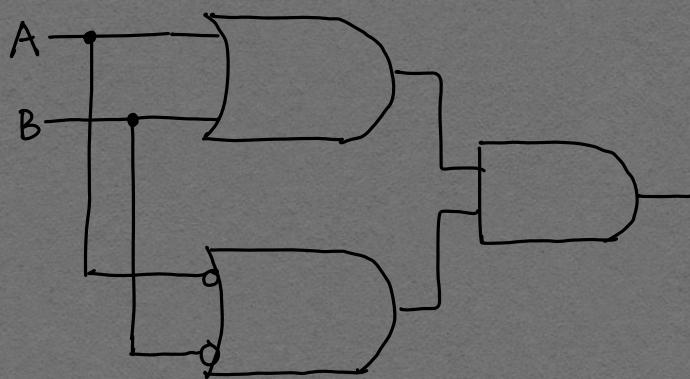
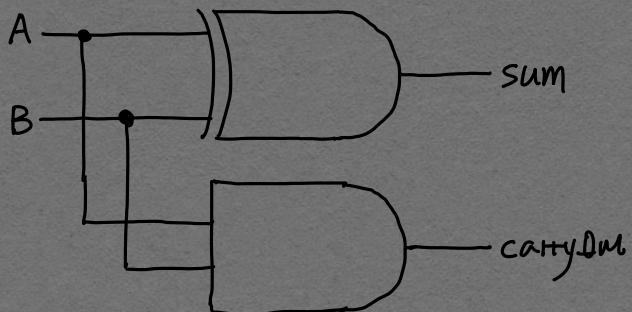


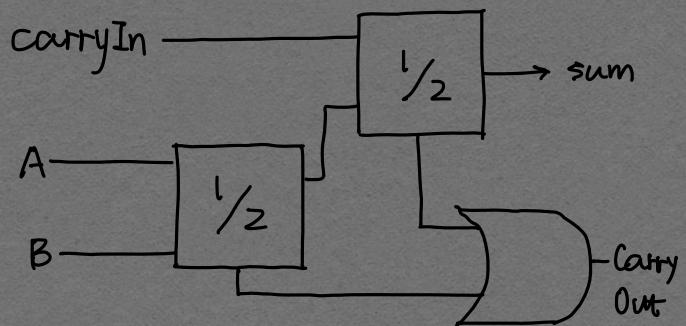
X O R



Half Adder



FULL ADDER



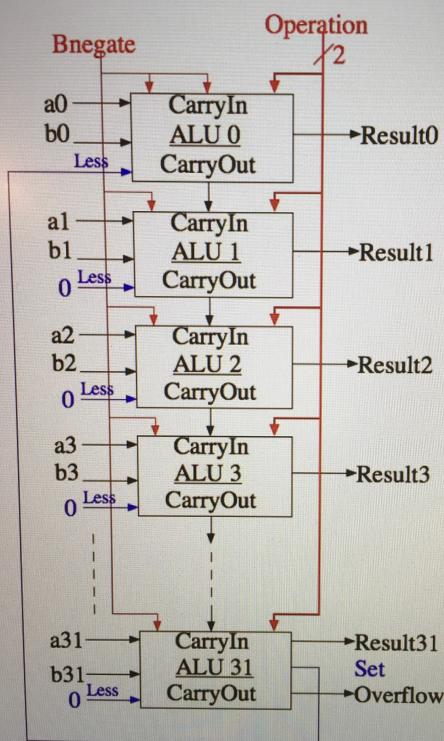
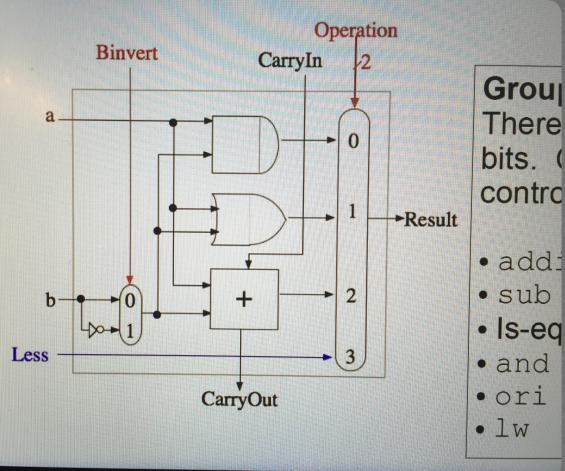
Sign Extension

```
int x = ...;
```

```
if((x & 0x8000) != 0) // 1000 0000 0000 0000
    x |= 0xFFFF0000
else
    x &= 0x0000FFFF
```

Set less than

→ adder result's MSB | less than
0



```
int64 multiply(int multiplicand_32,
               int multiplier)
{
    int64 retval = 0;
    int64 multiplicand = multiplicand_32;
    for (int i=0; i<32; i++)
    {
        int bit = (multiplier >> i) & 0x1;
        if (bit)
            retval += (multiplicand << i);
    }
    return retval;
}
```

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$$\begin{array}{r}
 * \quad | \quad | \quad | \\
 * \quad | \quad | \quad 0 \quad \text{bit} \\
 \hline
 \quad | \quad | \quad | \quad \ll 0 \\
 \quad 0 \quad 0 \quad 0 \\
 \quad | \quad | \quad | \quad \ll 2 \\
 \quad | \quad | \quad | \quad \ll 3 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 \quad \quad \quad 1 \quad 2 \quad 3 \\
 \quad \quad \quad * \quad 4 \quad 5 \quad 6 \\
 \hline
 123 * 456 = 123 * 10 + 246 * 228
 \end{array}$$

