

# Bitwise Operators Worksheet

(Comp Sci 1 Unit 25)

Why do we learn bitwise operators? Here are a few areas of computer science where bitwise operators are used.

- **Communication over ports/sockets**

Always involves checksums, parity, stop bits, flow control algorithms, and so on, which usually depend on the logic values of individual bytes as opposed to numeric values, since the medium may only be capable of transmitting one bit at a time.

- **Compression, Encryption**

Both of these are heavily dependent on bitwise algorithms. Look at the deflate algorithm for an example - everything is in bits, not bytes.

- **Finite State Machines**

Referring primarily of the kind embedded in some piece of hardware, although they can be found in software too. These are combinatorial in nature - they might literally be getting "compiled" down to a bunch of logic gates, so they have to be expressed as AND, OR, NOT, etc

**Directions:** Answer the following questions.

1.  $14 \& 7 =$

2.  $18 | 10 =$

3.  $9 \wedge 3 =$

**Order of Operations:**  $\sim$ ,  $\&$ ,  $\wedge$ ,  $|$

4.  $2 | 5 \& 3 =$

5.  $4 \& 7 \wedge 5 =$

6.  $\sim 8 =$

7.  $7 \ll 2 =$

8.  $5 \ll 32 =$

9.  $3 \ll 31 =$

10.  $5 \ll 35 =$

11.  $-8 \ll 33 =$

12.  $-2 \ll 64 =$

13.  $12 \gg 2 =$

14.  $-16 \gg 3 =$

15.  $7 \gg 1 =$

16.  $17 \gg 31 =$

17.  $-2 \gg 31 =$

18.  $8 \gg 34 =$

19.  $-1 \ggg 31 =$

20.  $32 \ggg 4 =$

21.  $-28 \gg 3 =$

22.  $\sim 1 =$