

# power of 2 examples

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## 1

### 1.1

Multiplication is complex...unless one of the multiplicands is the base the numbers are in themselves

Why signed and unsigned multiplication the same?

$$0011 = 3$$

$$001100 = 8 + 4 = 12 = 3 \times 2^2$$

$$1011 = -3$$

$$101100 = -12 \dots$$

### 1.2

Division:

$$0110 = 6$$

$$0001 = 1 = \left\lfloor \frac{6}{2^2} \right\rfloor$$

Signed 2's complement division by right shift:

$$10000110 = -128 + 6 = -122$$

$$11100001 = -31 = \left\lfloor \frac{-122}{2^2} \right\rfloor = \lfloor -30.5 \rfloor$$

which rounds towards  $-\infty$ .

What we want: -30 (towards 0)

## 2

Addition Modulo: operations done in  $\mathbb{Z}_n$ ;  $q \in \mathbb{Z}, a = nq + r, |r| < |n|$

$$1 +_2 1 = 0$$

$$x +_{15} 7 = 3, x = 15 + 3 - 7 = 11$$