

Recall: Congruence modulo 2 detects "evenness" or "oddness" (parity)

$$7 \equiv 1 \pmod{2} \quad \text{b/c } 7 \text{ and } 1 \text{ are both odd}$$

$$12 \equiv 0 \pmod{2} \quad \text{b/c } 12 \text{ and } 0 \text{ are both even}$$

Application of 1.12:  
even + even = even  
even + odd = odd  
odd + odd = even

• If  $a$  and  $b$  are both even, then  $a \equiv 0 \pmod{2}$   
 $b \equiv 0 \pmod{2}$

$$\begin{aligned} \Rightarrow a + b &\equiv 0 + 0 \pmod{2} \\ &\equiv 0 \pmod{2} \quad \Rightarrow a + b \text{ is even} \end{aligned}$$

•  $a$  even and  $b$  odd  $\Rightarrow a \equiv 0 \pmod{2}$   
 $b \equiv 1 \pmod{2}$

$$\begin{aligned} \Rightarrow a + b &\equiv 0 + 1 \pmod{2} \\ &\equiv 1 \pmod{2} \quad \Rightarrow a + b \text{ is odd.} \end{aligned}$$

• sim. for  $a$  odd and  $b$  odd.

Application of 1.14:  
even  $\cdot$  even = even  
even  $\cdot$  odd = even  
odd  $\cdot$  odd = odd

Wed. HW: 1.15 - 1.17, 1.20