

## 2-CNF-SAT

CNF where each term has exactly two literals

$$F = (a \vee b) \wedge (\bar{a} \vee \bar{c}) \wedge (\bar{b} \vee c) \wedge (\bar{b} \vee \bar{c})$$

The four terms must all be true.

$$(a \vee b) = a \text{ or } b \text{ is true}$$

= if  $a$  is false,  $b$  must be true  
and if  $b$  is false,  $a$  must be true

$$(a \vee b) = (\bar{a} \Rightarrow b) \wedge (\bar{b} \Rightarrow a)$$

$$\text{so } F = (\bar{a} \Rightarrow b) \wedge (a \Rightarrow \bar{c}) \wedge (b \Rightarrow c) \wedge (b \Rightarrow \bar{c}) \\ \wedge (\bar{b} \Rightarrow a) \wedge (c \Rightarrow \bar{a}) \wedge (\bar{c} \Rightarrow \bar{b}) \wedge (c \Rightarrow \bar{b})$$

a  
true

a  
false

b  
true

b  
false

c  
true

c  
false

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CNF where each term has exactly two literals

$$F = (a \vee b) \wedge (\bar{a} \vee \bar{c}) \wedge (\bar{b} \vee c) \wedge (\bar{b} \vee \bar{c}) \wedge (\bar{a} \vee b)$$

The four terms must all be true.

$(a \vee b)$  = a or b is true  
= if a is false, b must be true  
and if b is false, a must be true

$$(a \vee b) \equiv (\bar{a} \Rightarrow b) \wedge (\bar{b} \Rightarrow a)$$

$$\text{so } F = (\bar{a} \Rightarrow b) \wedge (a \Rightarrow \bar{c}) \wedge (b \Rightarrow c) \wedge (b \Rightarrow \bar{c}) \wedge (a \Rightarrow b) \\ \wedge (\bar{b} \Rightarrow a) \wedge (c \Rightarrow \bar{a}) \wedge (\bar{c} \Rightarrow \bar{b}) \wedge (c \Rightarrow \bar{b}) \wedge (\bar{b} \Rightarrow \bar{a})$$

a  
true

a  
false

b  
true

b  
false

c  
true

c  
false