

CSC 240

LOGIC 1

PROPOSITIONAL LOGIC

A proposition is a statement that is either true or false.

Cheese is good on pizza.

Superman could take Batman in a real fight.

Blue is the best color.

Not Propositions:

Commands aren't propositions.

Clean your room!

What time is it?

Neither are questions.

PROPOSITIONAL LOGIC

Implications:

If you play with fire, you'll get burned.

If it rains, you'll get wet.

$$P \Rightarrow Q$$

IMPLICATIONS

If you eat too much, you'll feel sick.

	P	Q	$P \Rightarrow Q$
You ate too much. You feel sick.	T	T	T
You ate too much. You don't feel sick.	T	F	F
You didn't eat too much. You feel sick.	F	T	T
You didn't eat too much. You don't feel sick.	F	F	T

$P \Rightarrow Q$ is false only if P is true and Q is false.

BICONDITIONALS

Biconditional:

I will only eat pizza if it is hot.

You will only get an A if you do your homework.

$P \Leftrightarrow Q$

I will only eat pizza "if and only if" it is hot.

I will only eat pizza iff it is hot.

The pizza is hot \Leftrightarrow I will eat the pizza.

BICONDITIONALS

You will only get an A **iff** you do your homework.

	P	Q	$P \iff Q$
You got an A. You did your homework.	T	T	T
You got an A. You didn't do your homework.	T	F	F
You didn't get an A. You did your homework.	F	T	F
You didn't get an A. You didn't do your homework.	F	F	T

$P \iff Q$ is false if P and Q don't have the same truth values.

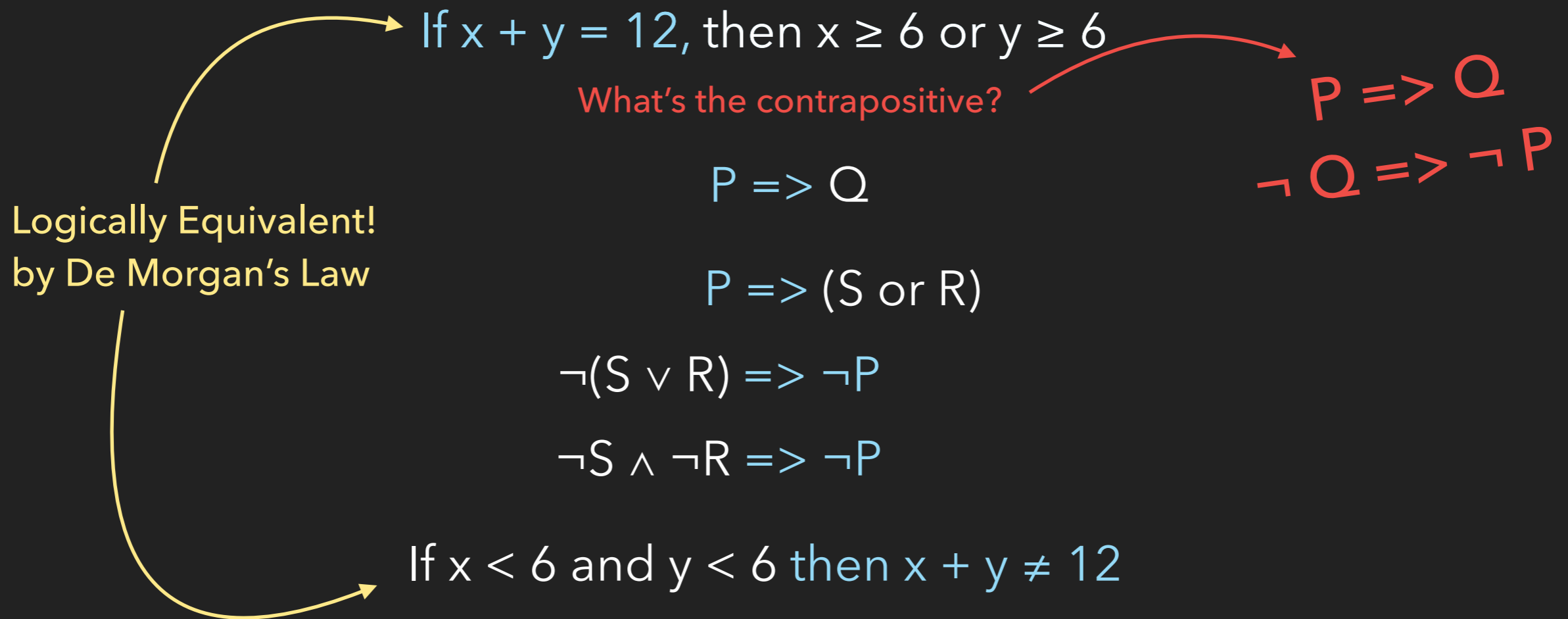
DE MORGAN'S LAW

$$\neg (p \vee q) = \neg p \wedge \neg q$$

$$\neg (p \wedge q) = \neg p \vee \neg q$$

WHO CARES

We can use propositional logic to transform statements into symbolic logic, making them easier to prove or disprove.



SET COMPLEMENTS

U = The Universal Set
"All the Things"

Alternate Notation:

A^c \overline{A} A' = $\{x \in U \mid x \notin A\}$

