

## Discrete Mathematics: Statement Forms

5 Logical Symbols:

- $\neg$  "not"
- $\wedge$  "and"
- $\vee$  "or"
- $\rightarrow$  "conditional"
- $\leftrightarrow$  "biconditional"

Statement Variables:

$p, q, r \dots$  etc

By combining the Logical Symbols and Statement Variables we can build more complex Logical Expressions, called a "Statement Form"

Example

$(\neg p) \vee q$  "not  $p$  or  $q$ " Statement Form

Truth Table for Statement Form  $(\neg p) \vee q$

$p$	$q$	$\neg p$	$(\neg p) \vee q$
T	T	F	T
T	F	F	F
F	T	T	T
F	F	T	T

Example 2: Find Truth Table for  $(p \wedge (\neg q)) \vee r$

$p$	$q$	$r$	$\neg q$	$(p \wedge (\neg q))$	$(p \wedge (\neg q)) \vee r$
T					
T					
T					

Example 2: Find the Truth-Table for  $(p \wedge (r \vee q)) \vee r$

P	q	r	$r \vee q$	$(p \wedge (r \vee q))$	$(p \wedge (r \vee q)) \vee r$
T	T	T	F	F	T
T	T	F	F	F	F
T	F	T	T	T	T
T	F	F	T	T	T
F	T	T	F	F	T
F	T	F	F	F	F
F	F	T	T	F	T
F	F	F	T	F	F

\* We want all possible combinations of T/F values

To Find How Many Truth Values we need For the table we will need  $2^n$  rows, where  $n$  is the number of letters in the truth table / statement form