Truth Table formation, Precedence of logical operators

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In this presentation we will discuss following things:

- Truth table formation of compound statements
- Precedence of logical operators

Truth Table

Truth tables are used to show/define the relationships between the truth values of the individual propositions and the compound propositions based on them.

p	q	$p \wedge q$	$p \vee q$	$p \oplus q$	$p \Rightarrow q$	$p \Leftrightarrow q$
0	0	0	0	0	1	1
0	1	0	1	1	1	0
1	0	0	1	1	0	0
1	1	1	1	0	1	1

Construct the truth table for the following compound proposition

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

p	q	$p \wedge q$	$\neg q$	$((p \wedge q) \vee \neg q)$
0	0	0	1	1
0	1	0	0	0
1	0	0	1	1
1	1	1	0	1

Truth Tables of Compound Propositions

We can use connectives to build up complicated compound propositions involving any number of propositional variables, then use truth tables to determine the truth value of these compound propositions.

Example: Construct the truth table of the compound proposition

$$(p \vee \neg q) \rightarrow (p \wedge q).$$

The Truth Table of $(p \vee \neg q) \rightarrow (p \wedge q)$.

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

Precedence of Logical Operators

We can use parentheses to specify the order in which logical operators in a compound proposition are to be applied.

To reduce the number of parentheses, the precedence order is defined for logical operators. As shown in next slide:

E.g. $\neg p \wedge q = (\neg p) \wedge q$

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

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

Precedence of Logical Operators.	
Operator	Precedence
$\neg$	1
$\wedge$	2
$\vee$	3
$\rightarrow$	4
$\leftrightarrow$	5

Videolink:1.https://www.youtube.com/watch?v=LNSfM86I8is&list=PLHXZ9OQGMqxersk8fUxiUMSIx0DBqsKZS&index=12

2. https://www.youtube.com/watch?v=O0KbymjE7xU

References: Discrete Mathematics and its application by Kenneth H Rosen

Thank You!!!!!