CSCA67 Worksheet – Logical Connectives, Implication

1 Working With Propositional Statements

Exercise. Use truth tables to show that the following pairs of statements are equivalent:

$\neg(s \wedge t)$ and $\neg s \vee \neg t$

$\neg(s \vee t)$ and $\neg s \wedge \neg t$

Exercise. Write English sentences that illustrate the above two *equivalence laws*.

- $\neg(s \wedge t)$ and $\neg s \vee \neg t$:
- $\neg(s \vee t)$ and $\neg s \wedge \neg t$:

Exercise. Which of the following are equivalent to $t \rightarrow s$?

- $\neg s \rightarrow \neg t$
- $\neg t \rightarrow \neg s$
- $s \rightarrow t$
- if s then t
- if t then s
- t, if s
- $\neg s$, if $\neg t$
- $\neg s \vee t$
- $s \vee \neg t$
- $\neg t \vee s$
- s, if t
- s is sufficient for t
- t is sufficient for s
- s is necessary for t
- t is necessary for s
- $\neg(t \wedge \neg s)$

Exercise. Lets use real statements. Let a, b and c be the lengths of sides of a triangle $\triangle abc$ where c is the hypotenuse.

$$\textit{If } \triangle abc \textit{ is a right triangle then } a^2 + b^2 = c^2.$$

Rewrite this implication using *sufficient*, *necessary*, *if*, and *negations*.

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