S. KIMMEL

Deductions: using known true statements to create new true statements

If you graduate, you must pass a swimming test. ← Q =T

You graduated ← P =T

∴ You passed a swim test. =T

} Premises

} Conclusion

$$\frac{P \rightarrow Q \qquad P}{\therefore Q}$$

If $P \rightarrow Q$ is true and P is true, then Q must be true

graduate, pass swim test

P	Q	P → Q
T	T	T
T	F	F
F	T	T
F	F	T

If premises are true, conclusion is true. If premises are false, conclusions don't hold.

This is like inductive Proof!

P(K) is true → P(K+1) is true

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$W \vee S$

$W \wedge P \rightarrow \neg T$

$T \rightarrow P \vee S$

$S \rightarrow P$

T

$\therefore$

$W = ?$

$P = ?$

$S = ?$

Solution

W	P	S	T
T	T	T	
T	T	F	
T	F	T	
T	F	F	
F	T	T	T
F	T	F	
F	F	T	
F	F	F	

In Words:

Because T and $T \rightarrow P \vee S$, must have $P \vee S$.

If $\neg S$, then must have P. But must have W because $W \vee S$ is true because $(W \wedge P) \rightarrow \neg T$

But now $W \wedge P$, so we must have $\neg T$. But T is true, so we must have gone wrong. Only choice was $\neg S$, so instead, try S. Then since $S \rightarrow P$, we have P. Now we can't have W, otherwise $\neg T$. Thus

S, P, $\neg T$, W, Black