Exercise 6. Let $P$, $Q$ and $R$ be statements. Use truth tables to answer the following questions.

a. If $(P \rightarrow Q) \land (Q \rightarrow R)$ is true, what can you conclude about $P \rightarrow R$?

b. If $(P \rightarrow R) \lor (Q \rightarrow R)$ is true, what can you conclude about $R$?

Exercise 7. Suppose you tell a child “If you don’t eat your dinner, then you won’t get any dessert.” The child eats dinner, but gets no dessert. From a logical standpoint, was your original statement a lie?

Exercise 8. Let $P$, $Q$ and $R$ be statements. Compute the truth tables for the following compound statements.

a. $(R \lor P) \rightarrow ((\neg P) \leftrightarrow R)$

b. $(Q \rightarrow R) \lor (P \land ((\neg Q) \rightarrow R))$

Exercise 9. Consider the following argument.

“If it’s sunny and I get up early, then I’ll go to the lake. I’ll either stay up late or get up early. If I stay up late, then I’ll be tired. I’m not tired and it’s sunny. Therefore, I’ll go to the lake.”

Assuming that the first four statements are true, explain why the conclusion must also be true.