Homework 9

Mengxiang Jiang

CSEN 5303 Foundations of Computer Science

October 20, 2022

Problem 1. Let p and q be the propositions

p: Swimming at the New Jersey shore is allowed.
q: Sharks have been spotted near the shore.

Express each of the following compound propositions, which uses p and q and logical connectives, as an English sentence.

1. $\neg q$
Sharks have not been spotted near the shore.

2. $p \wedge q$
Swimming at the New Jersey shore is allowed, and sharks have been spotted near the shore.

3. $\neg p \vee q$
Swimming at the New Jersey shore is not allowed, or else sharks have been spotted near the shore.

4. $p \to \neg q$
Swimming at the New Jersey shore is allowed, only if sharks have not been spotted near the shore.

5. $\neg q \to p$
Sharks have not been spotted near the shore, only if swimming at the New Jersey shore is allowed.

6. $\neg p \to \neg q$
Swimming at the New Jersey shore is not allowed, only if sharks have not been spotted near the shore.

7. $p \leftrightarrow \neg q$
Swimming at the New Jersey shore is allowed, if and only if sharks have not been spotted near the shore.

8. $\neg p \land (p \lor \neg q) \equiv (\neg p \land p) \lor (\neg p \land \neg q) \equiv \neg p \land \neg q$
Swimming at the New Jersey shore is not allowed, and sharks have not been spotted near the shore.

Problem 2. Let p and q be the propositions

p: You drive over 65 miles per hour.
q: You get a speeding ticket.

Write each of the following propositions using p and q and logical connectives.

1. You do not drive over 65 miles per hour.
$\neg p$

2. You drive over 65 miles per hour, but you do not get a speeding ticket.
$p \land \neg q$

3. You will get a speeding ticket if you drive over 65 miles per hour.
$p \rightarrow q$

4. If you do not drive over 65 miles per hour, then you will not get a speeding ticket.
$\neg p \rightarrow \neg q$

5. Driving over 65 miles per hour is sufficient for getting a speeding ticket.
$p \rightarrow q$

6. You get a speeding ticket, but you do not drive over 65 miles per hour.
$q \land \neg p$

7. Whenever you get a speeding ticket, you are driving over 65 miles per hour.
$q \rightarrow p$

Problem 3. Write each of the following propositions in the form "if p, then q" in English.
[Hint: Refer to the list of common ways to express conditional statements.]

1. I will remember to send you the address only if you send me an e-mail message.
If I remembered to send you the address, then you sent me an email message.

2. To be a citizen of this country, it is sufficient that you were born in the United States.
If you were born in the United States, then you are a citizen of this country.

3. If you keep your textbook, it will be a useful reference in your futures courses.
If you keep your textbook, then it will be a useful reference in your future courses.

4. The Red Wings will win the Stanley Cup if their goalie plays well.
If their goalie plays well, then the Red Wings will win the Stanley Cup.

5. That you got the job implies that you had the best credentials.
If you got the job, then you had the best credentials.

6. It is necessary to have a valid password to log onto the server.
If you logged onto the server, then you had a valid password.

7. You will reach the summit unless you begin your climb too late.
If you do not begin your climb too late, then you will reach the summit.