CS4182 Homework Exercises 4

1. Suppose the Hoare Triple $\{(x > 5) \wedge (y < 3)\}C\{Q\}$ is correct. Can you deduce that the triple $\{(x > 6 \wedge y < 0)\}C\{Q\}$ is correct? Explain.

2. Suppose the Hoare Triple $\{P\}C\{(x > 5) \wedge (y < 3)\}$ is correct. Can you deduce that the triple $\{P\}C\{(x > 6 \wedge y < 0)\}$ is correct? Explain.

3. Given that $\{x > y\}C_1\{u > v\}$ is correct, which of the following triples are guaranteed to be correct? If a triple is correct state which rule applies?

   - $\{x \geq y\}C_1\{u > v\}$
   - $\{x > (y - 2)\}C_1\{u > v\}$
   - $\{x > y\}C_1\{u \geq v\}$
   - $\{x > y\}C_1\{u \geq (v - 2)\}$
   - $\{x \geq y\}C_1\{u \geq v\}$
   - $\{x > y\}C_1\{u \geq (v + 2)\}$

4. If $\{P\}C\{Q\}$ holds, which of the following Hoare Triples can be proved correct? State whether the precondition is strengthened or weakened and do the same for the postcondition.

   - $\{P \vee (x > 0)\}C\{Q\}$
   - $\{P \wedge (x < 0)\}C\{Q\}$
   - $\{P\}C\{Q \vee (y > 0)\}$
   - $\{P\}C\{Q \wedge (y > 0)\}$
   - $\{P\}C\{Q \wedge P\}$

5. The following Hoare Triples are correct:

   - $\{j > 1\} i = i + 2; j = j + 3 \{j > 4\}$
   - $\{i > 2\} i = i + 2; j = j + 3 \{i > 4\}$

   Show that these triples imply that: $\{j > 5 \wedge i > 2\} i = i + 2; j = j + 3 \{j > 4 \wedge i > 0\}$ is correct

6. Show that the following Hoare Triple is correct:

   - $\{x > 10\} x = x - 7 \{x > 0\}$