1. If I study then I will not fail mathematics
   If I do not play basketball, then I will study
   But I failed mathematics.

   Therefore, I must have played basketball.

2. If it rains, Erick will be sick
   Erick was not sick

   Therefore, it did not rain.

3. S1: If a man is a bachelor, he is unhappy.
   S2: If a man is unhappy, he dies young.
   _____
   C: Bachelors die young

4. If 7 is less than 4, then 7 is not a prime number.
   7 is not less than 4.

   Therefore, 7 is a prime number.

5. If two sides of a triangle are equal, then the opposite angles are equal.
   Two sides of a triangle are not equal.

   Therefore, the opposite angles are not equal.

6. If it rains, Erik will be sick.
It did not rain.

Erik was not sick

7. I will ride my bike today.
If it is raining and I ride my bike, then I will get wet.
It is raining.
Therefore, I will get wet.

8. If I eat vegetables, I will be healthy and strong.
I am healthy and strong.
Therefore, I ate vegetables.

9. If I wait until the last minute to do my homework, then it will be a lot easier.
I wait until the last minute to do my homework.

Therefore, it will be a lot easier.

10. If 1 + 1 = 2, then pigs can fly.
1 + 1 = 2.
Therefore, pigs can fly.

11. All basketballs are round.
The Earth is round.

Therefore, the Earth is a basketball.

12. 2 is an even number.
If 7 is odd then 2 is not even.
If 7 is not odd then 8 is even.

_____

8   is even

13. If I don't change my oil regularly, my engine will die. My engine died. Thus, I didn't change my oil regularly.

14. Let A = {1, 2, 3, 4, 5}. Determine the truth value of each of the following statements:

(a) $(\exists x \in A)(x + 3 = 10)$ (c) $(\exists x \in A)(x + 3 < 5)$
(b) $(\forall x \in A)(x + 3 < 10)$ (d) $(\forall x \in A)(x + 3 \leq 7)$

15. Check for the validity of the following arguments:
a) $p \rightarrow q,\ q \rightarrow r \vdash p \rightarrow r$
b) $p \rightarrow \neg q, r \rightarrow q, r \vdash \neg p$