forall x notes

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1 Chapter 1 Practice Exercises

Part A Which of the following are 'sentences' in the logical sense?

1. **England is smaller than China.**
2. **Greenland is south of Jerusalem.**
3. Is New Jersey east of Wisconsin?
4. **The atomic number of helium is 2.**
5. **The atomic number of helium is π.**
6. **I hate overcooked noodles.**
7. Blech! Overcooked noodles!
8. **Overcooked noodles are disgusting.**
9. Take your time.
10. **This is the last question.**

Part B For each of the following: Is it a tautology, a contradiction, or a contingent sentence?

1. Caesar crossed the Rubicon. **(Contingent)**
2. Someone once crossed the Rubicon. **(Contingent)**
3. No one has ever crossed the Rubicon. **(Contingent)**
4. If Caesar crossed the Rubicon, then someone has. **(Tautology)**
5. Even though Caesar crossed the Rubicon, no one ever crossed the Rubicon. **(Contradiction)**
6. If anyone has ever crossed the Rubicon, it was Caesar. **(Contingent)**

Part C Look back at the sentences G1-G4 on p.11, and consider each of the following sets of sentences. Which are consistent? Which are inconsistent?

1. G2, G3, and G4 **(Consistent)**
2. G1, G3, and G4 **(Inconsistent)**
3. G1, G2, and G4 **(Consistent)**
4. G1, G2, and G3 **(Consistent)**

Part D Which of the following is possible? If it is possible, give an example. If it is not possible, explain why.

1. A valid argument that has one false premise and one true premise

   This is possible. For example:

   All men are carrots.

   Socrates is a man.

   $\therefore$ Socrates is a carrot.

2. A valid argument that has a false conclusion

   This is possible. The previous example for instance.

3. A valid argument, the conclusion of which is a contradiction

   This is possible. For example:

   All men are carrots.

   $\therefore$ It is both raining and not raining.

4. An invalid argument, the conclusion of which is a tautology

   This is not possible. All invalid arguments have true premises and a false conclusion; this means the conclusion cannot be tautology (which is always true).

5. A tautology that is contingent

   This is not possible since the definition of a contingent sentence requires that it not be a tautology.

6. Two logically equivalent sentences, both of which are tautologies

   This is possible. In fact, any two tautologies will always be logically equivalent as they are always true.

7. Two logically equivalent sentences, one of which is a tautology and one of which is contingent

   This is not possible. Logical equivalence means that the sentences necessarily have the same truth-value. Since a contingent sentence may be false, it does not necessarily have the same truth value as a tautological sentence which is always true.

8. Two logically equivalent sentences that together are an inconsistent set

   This is possible. Consider two sentences which are both contradictions. They must be logically equivalent since contradictions are always false; this also means it is not logically possible for the set containing these two sentences to be true at the same time.

9. A consistent set of sentences that contains a contradiction

   This is not possible. Since this set contains a sentence which is always false, it is not logically possible for all the members of the set to be true at the same time.

10. An inconsistent set of sentences that contains a tautology

    This is possible. Any inconsistent set of sentences will remain inconsistent if you add a tautology to it.

2 Chapter 2 Practice Exercises