Exercises in writing formulas of predicate calculus.

1. Assume the following predicates:
   \[ Hx: \text{x is a human} \]
   \[ Cx: \text{x is a car} \]
   \[ Tx: \text{x is a truck} \]
   \[ Dxy: \text{x drives y} \]

   Write formulas representing the obvious assumptions: no human is a car, no car is a truck, humans exist, cars exist, only humans drive, only cars and trucks are driven, etc.

2. Write formulas representing the following statements:
   (a) Everybody drives a car or a truck.
   (b) Some people drive both.
   (c) Some people don’t drive either.
   (d) Nobody drives both.

3. Assume in addition the following predicate:
   \[ Ixy: \text{x is identical to y} \]

   Write formulas representing the following statements:
   (a) Every car has at most one driver.
   (b) Every truck has exactly two drivers.
   (c) Everybody drives exactly one vehicle (car or truck).

4. Assume the following predicates:
   \[ Ixy: x = y \]
   \[ Pxyz: x \cdot y = z \]

   Write formulas representing the axioms for a group: axioms for equality, existence and uniqueness of products, associative law, existence of an identity element, existence of inverses.