1. Consider the statement “All widgets are muggolish.”
Write an equivalent statement in if-then form.

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2. Consider the statement “All computers are incapable of self-direction.”
Write the contrapositive of the statement.

3. Use a truth table to determine if $\neg Q \land (P \lor Q) \Rightarrow P$ is a tautology.

<table>
<thead>
<tr>
<th>$P$</th>
<th>$Q$</th>
<th>$\neg Q$</th>
<th>$P \lor Q$</th>
<th>$\neg Q \land (P \lor Q)$</th>
<th>$\neg Q \land (P \lor Q) \Rightarrow P$</th>
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Tautology?

4. Using all the following premises, form a valid conclusion.
   All organic food is healthy.
   All artificial sweeteners are unhealthy.
   No prune is nonorganic.

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5. Using all the following three premises, form a valid conclusion.
   All hummingbirds are richly colored.
   No large birds live on honey.
   Birds that do not live on honey are dull in color.

   Let $Q$ denote the statement $7 + 2 = 9$.
   Let $R$ denote the statement $5 + 2 = 7$.
   Determine if the statement $P \land Q \Rightarrow R$ is true.

7. Decide if the conclusion below can be proved from the given premises.
   **Premises:** If Barbara majors in physics, then she must pass all the calculus courses. If Barbara passes all the calculus courses, then she can explain the mean value theorem. Barbara has passed all the calculus courses.
   **Conclusion:** Barbara is a physics major, and she can explain the mean value theorem.

8. Negate the following statement: Every student at the university studies hard.
   a. No student at the university studies hard.
   b. Every student at the university hardly studies.
   c. Not all students at the university study hard.
   d. Some students at the university study hard.
   e. None of the above is a negation of the statement.
9. Let \( P \) denote the statement “Tom drives fast”, and let \( Q \) denote the statement “Tom is happy”. Suppose the truth value of \( P \) is false and the truth value of \( Q \) is true. What is the truth value of \( P \Rightarrow Q \)?

10. Write the converse of the following statement: Every student at the university studies hard.

   a. The university studies every student hard.
   b. If one does not study hard, then one is not a student at the university.
   c. If one is a student at the university, then one does not study hard.
   d. If one studies hard, then one is a student at the university.
   e. None of the above is a converse of the statement.

11. Negate the following statement: If the stadium is built, then the owners are happy.

   a. If the owners are happy, then the stadium is built.
   b. If the owners are not happy, then the stadium is not built.
   c. If the stadium is built, then the owners are not happy.
   d. The stadium is not built or the owners are happy.
   e. The stadium is built and the owners are not happy.

12. Consider the following premises.
   1. Purple people believe orange people are evil.
   2. Orange people believe purple people are evil.
   3. Purple people and orange people hate people they believe to be evil.
   4. If one hates another person and believes that other person to be evil, then one has few qualms in harming the other person.

   Given the above premises, is the following conclusion a valid conclusion.
   Purple people have few qualms in harming orange people, and orange people have few qualms in harming purple people.

13. A fox, hunting for a morsel of food, spotted a huge bear about a 100 yards due east of him. Before the hunter could become the hunted, the crafty fox ran due north for 100 yards but then realized the bear had not noticed him. Thus he stopped and remained hidden. At this point the bear was due south of the fox. What was the color of the bear?