1. Two angles are not congruent.

2. You are sixteen years old.

3. The angle is obtuse.

4. The soccer game is not on Friday.

5. The figure is not a triangle.

6. $m\angle A \geq 90$

7. a. If you don't eat all of your vegetables, then you won't grow.

b. If you won't grow, then you don't eat all of your vegetables.

8. a. If a figure is not a square, then at least one of its angles is not a right angle.

b. If at least one of the angles is not a right angle, then the figure is not a square.

9. a. If a figure isn't a rectangle, then it doesn't have four sides.

b. If a figure doesn't have four sides, then it isn't a rectangle.

10. Assume that it is not raining outside.

11. Assume that $\angle J$ is a right angle.

12. Assume that $\triangle PEN$ is not isosceles.

13. Assume that none of the angles is obtuse.

14. Assume that $\overline{XY} \ncong \overline{AB}$.

15. Assume that $m\angle 2 \leq 90$.

16. I and II

17. I and II

18. I and III

19. II and III

20. **a.** 20 or more

b. the Debate Club and the Chess Club have fewer than 20 members

c. the Debate Club has fewer than 10 members

21. **a.** right angle

b. right angles

c. 90

d. 180

e. 90

f. 90

g. 0

h. more than one right angle

i. at most one right angle

22. Assume $\angle A \cong \angle B$. Then $\overline{BC} \cong \overline{AC}$ since if the base $\measuredangle$s are $\cong$, the sides opp. them are $\cong$. But this contradicts the given $BC > AC$. Thus $\angle A \ncong \angle B$.

23. Assume one base $\angle$ is a right $\angle$. Then the other base $\angle$ is also a right $\angle$ since the base $\measuredangle$s of an isosceles $\triangle$ are congruent. But a $\triangle$ can have at most one right $\angle$. So neither base $\angle$ is a right $\angle$.

24. **a.** If you don't live in El Paso, then you don't live in Texas; false

b. If you don't live in Texas, then you don't live in El Paso; true

25. a. If four points aren't collinear, then they aren't coplanar; false

b. If four points aren't coplanar, then they aren't collinear; true

26–29. Answers may vary. Samples are given.

26. If a figure is a square, then it has four right angles.

27. If today is Sunday, then tomorrow is Monday.

28. Not possible; a conditional and its contrapositive have the same truth value.

29. If two sides of a triangle are congruent, then the triangle is isosceles.

30. Assume that the driver did not apply the brakes. Then there would be no skid marks. This contradicts the fact that fresh skid marks appear. Thus the green car applied the brakes is a true statement.

31. Assume that the temperature outside is more than 32°F. Then ice would not be forming on the sidewalk. This contradicts the fact that ice is forming. Thus the statement that the temperature must be 32°F or less is true.

32. Assume that an obtuse triangle can contain a right angle. Then the sum of the measures of the obtuse angle and the right angle is more than 180. This contradicts the fact that the sum of the 3 angles of a triangle is 180. Thus the statement that an obtuse triangle cannot contain a right angle is true.

33. Assume $\overleftrightarrow{XY}$ and $\overleftrightarrow{XZ}$ are two different lines $\perp$ to $\overleftrightarrow{AX}$, with Y and Z on the same side of $\overleftrightarrow{AX}$. If B is on $\overleftrightarrow{AX}$ opp. pt. A from X, then $m\angle AXY + m\angle YXZ + m\angle ZXB = 180$. But $m\angle AXY = m\angle ZXB = 90$, so $m\angle YXZ = 0$. Thus X,Y, and Z are collinear.

34. If the animal is a kitten, then it is a cat. If the animal isn't a cat, then it's not a kitten.

35. If the angle measures 120, then it is obtuse. If the angle isn't obtuse, then it doesn't measure 120.

36. If a number is a whole number, then it is an integer. If a number isn't an integer, then it isn't a whole number.

37. Angie assumed that the inverse of the statement was true, but a conditional and its inverse may not have the same truth value.

38. **a.** Earl proves that it's later than 5:00.

b. He starts with the assumption that it is before 5:00.

c. It is not noisy.

39. The culprit entered the room through a hole in the roof; the other possibilities were eliminated.

40. Check students' work.

41. Assume $\overline{XB} \perp \overline{AC}$. Then $\angle AXB$ and $\angle CXB$ are right $\measuredangle$s. Since $m\angle ABX = m\angle CBX = 36$, then $\angle A \cong \angle C$ because if two $\measuredangle$s of a $\triangle$ are $\cong$, the third $\measuredangle$s are $\cong$. Then $AB = BC$ since sides opp. $\cong$ $\measuredangle$s are $\cong$ and $\triangle ABC$ is an isosceles $\triangle$. But this contradicts the given statement that $\triangle ABC$ is scalene. Thus, $\overline{XB}$ is not $\perp$ to $\overline{AC}$.