**Homework 1.3 – Logic Statements**

Identify the hypothesis and the conclusion of each conditional statement.

1. hypothesis: two angles are vertical angles

conclusion: the two angles are congruent

3. hypothesis: Sam does not get a C or above on his midterm

conclusion: he will fail the class

5. hypothesis: you live in Riverside

conclusion: you live in California

7. hypothesis: two angles are supplementary

conclusion:  the measure of their sum equals 180

9. hypothesis: points lie in the same plane

conclusion: the points are coplanar

11. hypothesis: two lines intersect at right angles

conclusion:  the two lines are perpendicular

# Rewrite the following statements as a conditional statement:

**If p, then q**

13. If the gas tank is empty, then the tank needs gasoline.

15. If Nancy was late for her meeting, then she lost track of time.

# Write the converse of the following conditional statements:

**If q, then p**

17. If the two angles are congruent, then they are vertical angles.

19. If Sam fail the class, then he did not get a C or above in his midterm.

21. If you live in California, then you live in Riverside.

23. If the sum of two angles measure 180, then two angles are supplementary.

25. If three points are coplanar, then they lie on the same plane.

27. If two lines are perpendicular, then they intersect at right angles.

29.

# Find the following:

**p if and only if q**

1. If two angles are vertical angles, then the two angles are congruent. (true)

If two angles are congruent, then the angles are vertical angles. (false)

*Vertical angles are not the only angles that are congruent.*

2. If you stay up late, then you will be tired. (true)

If you are tired, then you stayed up late. (false)

*I can be tired from working out.*

3. If Sam does not get a C or above on his midterm, then he will fail the class. (false)

*This depends on Sam’s overall grade.*

If Sam fails the class, then he did not get a C or above in his midterm. (false)

*This depends on Sam’s overall grade.*

4. If Sandy can beat Jeff in a foot race, then Sandy is a faster runner than Jeff. (true)

If Sandy is a faster runner than Jeff, then Sandy can beat Jeff in a foot race. (true)

*Sandy can beat Jeff in a foot race if and only if Sandy is a faster runner than Jeff.*

5. If you live in Riverside, then you live in California. (false)

*Riverside can be any city or town in the US.*

If you live in California, then you live in Riverside. (false)

*You can live in anywhere in California besides Riverside.*

6. If two lines are perpendicular, then the two lines intersect at right angles. (true)

If two lines intersect at right angles, then the two lines are perpendicular. (true)

*Two lines are perpendicular if and only if the two lines intersect at right angles.*

# Determine if the following "if and only if" statements are valid or invalid and justify your answer.   If false, give a counterexample.

31. false, converse fails: The grass can be wet when the sprinklers are on.

33. false, conditional fails: If the animal is a mammal, it can be a lion.

35. true

37. false, converse fails: if x is an integer, then it can be any number than 0.

39. false, converse fails: if x is rational, then it doesn’t have to be an integer.

41. true

43. false, conditional fails: Dustin might not go to traffic school if he gets a speeding ticket.

false, converse fails: Dustin might go to traffic school on his own will.

45. false, converse fails: A college graduate doesn’t always have to be a doctor.

47. false, converse fails: An object can be anything other than a square if it is a triangle.

# Write a syllogism with these three phrases:

**if (a implies b and b implies c), then (a implies c)**

49. If Dustin speeds, then Dustin’s insurance increases.

# Find the inverse of the following conditional statements:

**if not p, then not q**

51. If two angles are not vertical angles, then the two angles are not congruent.

53. If Sam gets a C or above on his midterm, then he will not fail the class.

55. If you do not live in Riverside, then you do not live in California.

57. If two angles are not supplementary, then the measure of their sum do not equal 180o.

59. If points do not lie in the same plane, then the points are not coplanar.

61. If two lines do not intersect at right angles, then the two lines are not perpendicular.

# Find the contrapositive of the following conditional statements:

**(converse + inverse) of a conditional statement**

63. If the two angles are not congruent, then the two angles are not vertical angles.

65. If Sam does not fail the class, then Sam gets a C or above on his midterm.

67. If you do not live in California, then you do not live in Riverside.

69. If the measure of two angles sum do not equals 180o, then the two angles are not supplementary.

71. If the points are not coplanar, then the points do not lie in the same plane.

73. If two lines are not perpendicular, then the two lines do not intersect at right angles.