Day 04 HW:

Deductive Reasoning (2-4)

Name Master C
Date _____ Block _____

Using *p* and *q*, write the symbolic statement in words. **p : The value of x is 4.** **q : 3x + 2 = 14**

1. a) $\sim p$ The value of $x \neq 4$ b) $\sim q$ $3x+2 \neq 14$ c) $q \rightarrow p$ If $3x+2=4$, then $x=4$

2. a) $\sim q \rightarrow \sim p$ If $3x+2 \neq 14$, then $x \neq 4$ b) $p \rightarrow q$ If $x=4$, then $3x+2=14$ c) $\sim p \rightarrow \sim q$ If $x \neq 4$, then $3x+2 \neq 14$

Determine if statement (3) follows from statements (1) and (2) by the Law of Detachment or the Law of Syllogism. If it does, state which law was used. If it does not, write invalid.

3. (1) If an angle measures more than 90°, then it is not acute. $p \rightarrow q$
   (2) $m\angle ABC = 120°$ p $\therefore q$
   (3) $\angle ABC$ is not acute. Law of Detachment

4. (1) All 45° angles are congruent. If angles are 45°, then they are $\cong$. $p \rightarrow q$
   (2) $\angle A \cong \angle B$ q
   (3) $\angle A$ and $\angle B$ are 45° p Invalid

5. (1) If you order the apple pie, then it will be served with ice cream. $p \rightarrow q$
   (2) Matthew ordered the apple pie. p $\therefore q$
   (3) Matthew was served ice cream. Law of Detachment

6. (1) If you wear the school colors, then you have school spirit $p \rightarrow q$
   (2) If you have school spirit, then the team feels great. $q \rightarrow r$
   (3) If you wear the school colors, then the team will feel great. $p \rightarrow r$ Law of Syllogism

7. (1) If you eat too much turkey, then you will get sick. $p \rightarrow q$
   (2) Kinsley got sick. q
   (3) Kinsley ate too much turkey. p Invalid

8. (1) If $\angle 2$ is acute, then $\angle 3$ is obtuse. $p \rightarrow q$
   (2) If $\angle 3$ is obtuse then $\angle 4$ is acute. $q \rightarrow r$
   (3) If $\angle 2$ is acute, then $\angle 4$ is acute. $p \rightarrow r$ Law of Syllogism

In exercises 9-14, assume the following statements are true.

- If Susan screams, then the dog will run away. (3)
- If the dog licks Susan, then Susan will scream. (2)
- If Carl tells the dog to "kiss", then the dog will lick Susan. (1)
- Carl tells the dog to "kiss." (4)

9. Write the contrapositive of the third statement. If the dog doesn't lick Susan, then Carl didn't tell the dog to kiss.
10. Write the inverse of the second statement. If the dog doesn't lick Susan, then Susan won't scream
11. Write the converse of the first statement. If the dog runs away, then Susan will scream
12. Write the premises in an order which makes a valid argument.
    If Carl tells the dog to "kiss", then the dog will lick Susan
    If the dog licks Susan, then Susan will scream.
    If Susan screams, then the dog will run away.
    Carl tells the dog to "kiss."
13. Did the dog lick Susan? Explain. Yes, Carl told him to
14. Did the dog run away? Explain. Yes, because Susan

For each conditional statement, identify the hypothesis (circle) and the conclusion (underline).

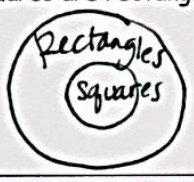
1. If it is sunny outside, we will go to the park.
2. When I don't get enough sleep, then I get cranky.
3. If it is a B day, then I have Geometry.

For the conditional statements in #1 only, write the:

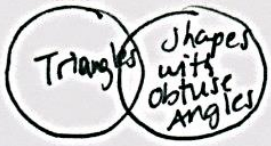
4. Inverse If it is not sunny outside, then we won't go to the park.
5. Converse If we go to the park, then it is sunny outside
6. Contrapositive If we don't go to the park, then it isn't sunny.

Draw a Venn diagram to illustrate each of the following statements.

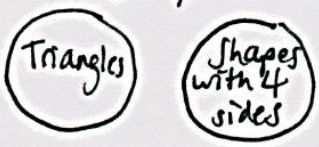
7. All squares are rectangles.



8. Some triangles have obtuse angles.



9. No triangles have four sides.



Translate each short argument into symbols, and determine if the conclusion is valid. If it is valid, state the law of logic used. If it is not, state why.

10. If Dale lives in Panama, then he is a resident of South America.
    Dale lives in Panama.
    Thus Dale is a resident of South America.
    $p \to q$, p, $\therefore q$ — Law of Detachment
11. If a triangle is equilateral, then all three sides are congruent.
    If all the sides of a triangle are congruent, then the angles opposite them are congruent.
    Thus if a triangle is equilateral, then the angles opposite the sides are congruent.
    $p \to q$, $q \to r$, $p \to r$ — Law of Syllogism
12. If I want to buy a new computer, I have to save my money.
    I saved my money.
    Thus I can buy a new computer.
    $p \to q$, q, p — Invalid LOD
13. If Sam is home, then we can play.
    If we can play, then we won't fight.
    Thus if we don't fight, then Sam is home.
    $p \to q$, $q \to r$, $\therefore r \to p$ — Invalid LOS
14. If a figure is a square, then it is a rectangle.
    This figure is not a square.
    Therefore it is not a rectangle.
    $p \to q$, $\sim p$, $\therefore \sim q$ — Invalid
15. If a student is on the honor roll, then he or she has an "A" average.
    If a student has an "A" average, then he or she does well in school.
    Thus if a student is on the honor roll, he or she does well in school.
    $p \to q$, $q \to r$, $p \to r$ — Law of Syllogism
16. All Virginia Beach mathematics teachers are excellent teachers.
    Our teacher is a Virginia Beach mathematics teacher.
    Thus our teacher is an excellent teacher.
    $p \to q$, p, q — Law of Detachment
17. If our soccer team is undefeated, then we will be in first place.
    Our soccer team is in first place.
    Therefore they are undefeated.
    $p \to q$, q, r — Invalid LOD
18. If your pet is a dog, then it eats chickens.
    Your pet is a cat.
    Thus your pet does not eat chickens.
    $p \to q$, r, $\sim q$ — Invalid
19. If Mario is tall, then he could be a good basketball player.
    Mario is tall.
    Thus Mario could be a good basketball player.
    $p \to q$, p, $\therefore q$ — Law of Detachment