

Name: \_\_\_\_\_

Period: \_\_\_\_\_

**Math Studies**

**Logic IB Questions**

1. Alan plays for Newcastle United football team.  
 $p$  represents Alan scoring a goal.  
 $q$  is Newcastle winning the game.

a) Complete the following truth table:

$p$	$q$	$\neg p$	$\neg q$	$\neg p \Rightarrow \neg q$

b) Describe in words what the final column of the table,  $\neg p \Rightarrow \neg q$ , represents.

2. Two propositions are defined as follows:

$p$ : Louis plays the trumpet.

$q$ : Louis is a part of the school band.

a) Write the following statements in symbolic form.

- 1) Louis plays the trumpet and is in the school band.
- 2) If Louis plays the trumpet, then he is in the school band.

b) Write a statement that describes the following:  $\neg q \Leftrightarrow \neg p$

3. Consider the statement: "If a shape is a circle, then it is an ellipse."

a) For this statement, write in words:

- 1) its contrapositive.
- 2) its inverse.
- 3) its converse.

b) Which, if any, of the four above statements is true?

4. Two propositions are defined as follows:

$p$ : Homer eats donuts.

$q$ : Homer is overweight.

a) Write in symbolic form: "If Homer does not eat donuts, then he will not be overweight."

b) Complete the following truth table for the statement:  $\neg(p \wedge q)$

$p$	$q$	$p \wedge q$	$\neg(p \wedge q)$

c) What does the final column of the truth table indicate about the validity of the argument?