Worksheet #11

Math 0997: Support for Quantitative Reasoning  
Student Name:_____________________________

I. A statement is a sentence that is either true or false, but not both simultaneously.

Write ‘yes’ if the sentence is a statement and write ‘no’ if the sentence is not a statement.

(a)_____ Atlanta is in Georgia.               (e) _______ Is this your pencil?
(b)_____ Go Jags!                            (f)_______ Noon occurs at 3:00 p.m.
(c) _____ Five is a number.                  (g)_______ Clean the house.
(d)____ _H₂O represents water.               (h)_______ Joe is the best looking man in the world.

II. The negation of a true statement is a false statement.
The negation of a false statement is a true statement.
example: The negation of the statement ‘John works hard’ is ‘John does not work hard’.

Negate the following statements:

(a) statement: Today is Saturday.
   negation:________________________________

(b) statement: Bob drives a Volvo.
   negation:________________________________

(c) statement: The year is not 2013.
   negation:________________________________

(d) statement: Sue will not be attending the dance.
   negation:________________________________
III. The symbol used for negation is the tilde symbol which looks like this \(~\)  
Suppose that we let the following lowercase letters represent the given statements:  
\(p:\) The house is on a hill.  
\(q:\) We are going to the movies.  
\(r:\) Lunch is not expensive.  
\(w:\) Blue is a color.  

Then the translation of the symbolic statement \(\sim w\) into words is: ‘Blue is not a color’

Express these symbolic statements in words:

(a) \(\sim p\) ____________________________________________  
(b) \(\sim q\) ____________________________________________  
(c) \(\sim r\) ____________________________________________  

IV. Interpret information on the bar graph. Determine if statements are true or false.

(a)_____ The profit in 2013 was $10,000.  
(b)_____ The profit increased from 2013 to 2014.  
(c)_____ The profit doubled from 2012 to 2013.  
(d)_____ The total profit from 2011 through 2013 was $12 million.
V. The symbol used for the word ‘and’ is \( \land \)
The symbol used for the word ‘or’ is \( \lor \)

Suppose that we let the following lowercase letters represent the given statements:

\[
\begin{align*}
p & : \text{Today is Saturday.} \\
q & : \text{We are going to the movies.} \\
r & : \text{Lunch is not expensive.} \\
w & : \text{We will stay home.}
\end{align*}
\]

Express these symbolic statements in words:

(a) \( p \land q \)  
(b) \( q \lor w \)  
(c) \( \neg p \land w \)  
(d) \( r \lor \neg q \)
VI. The symbol used for ‘If, then’ is an arrow that looks like this $\rightarrow$.

Suppose that we let the following lowercase letters represent the given statements:

$p$: Today is Saturday.
$q$: We are going to the movies.
$r$: Lunch is not expensive.
$w$: We will stay home.

Example: $p \rightarrow w$ translates to ‘If today is Saturday, then we will stay home.

Express the following symbolic statements in words:

(a) $p \rightarrow q$ __________________________________________________________
________________________________________________________________________

(b) $q \rightarrow \sim w$ _______________________________________________________
________________________________________________________________________

(c) $\sim p \rightarrow w$ ______________________________________________________
________________________________________________________________________

(d) $\sim r \rightarrow p$ _______________________________________________________
________________________________________________________________________
VII. The symbol used for ‘if and only if’ is a double arrow that looks like this \( \leftrightarrow \)

Suppose that we let the following lowercase letters represent the given statements:

- \( a \) : She gets paid.
- \( b \) : The job is not secure.
- \( c \) : She shows up on time.
- \( d \) : Today is Friday.

Example: \( a \leftrightarrow d \) translates to ‘She gets paid if and only if today is Friday.

Express the following symbolic statements in words:

(a) \( c \leftrightarrow a \) ____________________________________________________________
    __________________________________________________________________________

(b) \( b \leftrightarrow \sim c \) __________________________________________________________
    __________________________________________________________________________

(c) \( d \leftrightarrow b \) __________________________________________________________
    __________________________________________________________________________

(d) \( \sim b \leftrightarrow c \) _________________________________________________________
    __________________________________________________________________________