1. Given the dictionary:
   \( p \): I went home for the holidays.
   \( q \): I ate too much.
   \( r \): I had a good time.
represent the following statement in symbolic form: "Whenever I go home for the holidays, I eat too much and I have a good time."

A) \((p \rightarrow \sim q) \land r\)  
B) \(p \rightarrow (q \land r)\)  
C) \((p \land \sim q) \rightarrow r\)  
D) \(p \rightarrow (\sim q \land r)\)

2. Given the dictionary:
   
   \( R: x = 2 \) 
   \( S: y = 1, \) 
   \( T: y = 2, \)
what is the translation of \( R \land (S \lor T)\)?

A) If \( x = 2 \), then \( y = 1 \) or 2.  
B) Either \( x = 2 \) or \( y = 1 \) or 2.  
C) \( x = 2 \) and either \( y = 1 \) or \( y = 2. \)  
D) \( y = 1 \) or 2 whenever \( x = 1. \)

3. Given \( p \) is T, \( q \) is F and \( r \) is F, which two of the statements below are T?

I. \( p \land r \) 
II. \( p \lor r \) 
III. \( \sim p \rightarrow r \) 
IV. \( \sim q \rightarrow \sim p \)

A) I and II  
B) I and III  
C) I and IV  
D) II and III
E) II and IV

4. A negation of the statement “If it doesn't snow, then I'll go to the beach.” is:

A) It snows, but I don't go to the beach.  
B) If it doesn't snow, then I won't go to the beach.  
C) If it snows, then I'll go to the beach.  
D) It doesn't snow, but I don't go to the beach.

5. A negation of the statement “Every Ford has bad tires” is:

A) No Ford has bad tires.  
B) Some Fords have bad tires.  
C) Some Fords do not have bad tires.  
D) All Fords have good tires.

6. For the following two statements:
I. \( 2 + 2 = 3 \) and \( 2 + 2 = 4. \)  
II. No numbers are even.

A) I is true and II is true.  
B) I is true and II is false.  
C) I is false and II is true.  
D) I is false and II is false.
Form A

7. In a symbolic translation of the statement “The movie was long and boring, but we stayed anyway”, how many statements will be in the dictionary? (Remember, a dictionary must contain no compound statements.)

A) 1  B) 2  C) 3  D) 4

8. Fill in the blank with 1 or more characters (letters/symbols) to make the given statements logically equivalent: \( P \land R \equiv \sim (\sim P \_ \_ \_ \_ \) )

A) \( \land \ R \)  B) \( \lor \sim R \)  C) \( \land \sim R \)  D) \( \lor R \)  E) None of the above

9. Which form below is logically equivalent to \( \sim P \rightarrow Q \)?

A) \( \sim Q \rightarrow P \)  B) \( \sim (P \land \sim Q) \)  C) \( \sim (P \lor Q) \)  D) \( Q \rightarrow \sim P \)

10. In the truth table below, what should the values of A and B be?

<table>
<thead>
<tr>
<th>( p )</th>
<th>( q )</th>
<th>( r )</th>
<th>( (p \lor q) \land r )</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>T</td>
<td>A</td>
</tr>
<tr>
<td>F</td>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>F</td>
<td>F</td>
<td>F</td>
<td>B</td>
</tr>
</tbody>
</table>

A) A = T, B = T  B) A = T, B = F  C) A = F, B = T  D) A = F, B = F

11. In the truth table below, find an incorrect column (col. 3 - col. 6).

<table>
<thead>
<tr>
<th>( p )</th>
<th>( q )</th>
<th>( \sim (p \lor q) )</th>
<th>( \sim p \rightarrow q )</th>
<th>( p \land \sim q )</th>
<th>( q \rightarrow p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>F</td>
<td>T</td>
<td>F</td>
<td>T</td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>F</td>
<td>T</td>
<td>T</td>
<td>T</td>
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<td>F</td>
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<td>T</td>
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<tr>
<td>F</td>
<td>F</td>
<td>T</td>
<td>F</td>
<td>F</td>
<td>T</td>
</tr>
</tbody>
</table>

A) col. 3  B) col. 4  C) col. 5  D) col. 6
12. In the argument below, which Invalid Argument Form (if any) is represented?
If Julie is a good swimmer, then she will win.
Julie will win
Julie is a good swimmer.

A) Fallacy of the converse    B) Invalid Disjunctive Syllogism
C) Fallacy of the inverse    D) None of the above applies

13. In the argument below, which Valid Argument Form is represented?
That man is either a Senator or a Representative.
He is not a Representative.
He is a Senator.

A) Modus Ponens    B) Modus Tollens    C) Disjunctive Syllogism    D) Law of Transitivity

14. Find a valid conclusion for the following premises:

\[(A \rightarrow B) \rightarrow C\]

\[\sim C\]

A) A    B) \(A \rightarrow B\)    C) \(B\)    D) \(\sim (A \rightarrow B)\)

15. Find a symbolic negation of \(p \lor (\sim a \land \sim b)\)

A) \(\sim p \lor (\sim a \land \sim b)\)    B) \(p \land (\sim a \lor b)\)
C) \(\sim p \lor (a \land \sim b)\)    D) \(p \land (a \lor b)\)

16. Given the argument forms

I) \(\sim S \rightarrow \sim R\)    II) If \(x^2 = 9\), then \(x = \pm 3\).

\(\sim S\)

\(\sim R\)

\(\frac{x = \pm 3}{x^2 \neq 9}\)

A) I is valid and II is valid    B) I is valid and II is invalid
C) I is invalid and II is valid    D) I is invalid and II is invalid
17. Which two statements below mean the same as “If the weather is hot then my grass grows”? 

I) My grass growing is sufficient for hot weather.  
II) My grass growing is necessary for hot weather.  
III) The weather is hot only if the grass grows.  
IV) The weather is hot whenever my grass grows.  
A) I and II  
B) I and III  
C) I and IV  
D) II and III  
E) II and IV  

Information for problems 18 - 20 below The truth table below is being used to determine if the following argument is valid. 

If we go to a movie, we get popcorn or a Coke.  
We've gotten popcorn.  
We've gone to a movie. 

Dictionary - \( p \): We go to a movie, \( q \): We get popcorn, \( r \): We get a Coke. 

\[
\begin{array}{cccc|c|c}
 p & q & r & q \lor r & p \to (q \lor r) & X & \left\{ (p \to (q \lor r)) \land q \right\} \to p \\
 T & T & T & T & T & T \\
 T & T & F & T & T & T \\
 T & F & T & T & T & T \\
 T & F & F & F & A & F \\
 F & T & T & T & T & F \\
 F & T & F & T & T & B \\
 F & F & T & T & F & T \\
 F & F & F & T & F & T \\
\end{array}
\]

Note the locations of A, B and X in the above table. 

18. What should be in place of the X? 

A) \( p \)  
B) \( [p \to (q \lor r)] \to p \)  
C) \( [p \to (q \lor r)] \land q \)  
D) \( \left\{ (p \to (q \lor r)) \land q \right\} \to p \)  

19. The values of A and B are: 

A) A = T, B = T  
B) A = T, B = F  
C) A = F, B = T  
D) A = F, B = F  

20. The argument is: 

A) valid  
B) invalid
21. **Bonus question** Translate into “If . . ., then . . .” form: Every new baby cries.

A) If a baby cries, then it is new.  
B) If a new thing cries, then it is a baby.  
C) If a baby is new, then it cries.  
D) If a new baby cries, then that's OK.
Answers Form A
1B
2C
3D
4D
5C
6D
7C
8B
9A
10B
11A
12A
13C
14D
15D
16B
17D
18C
19D
20B
21C