Exam 1 will be on 02/02/12 and cover the following sections: 8.1, 8.2, 8.3, 8.4, 8.6, 9.1, 9.2.

**Decide whether the following is a statement or is not a statement.**
1) Not all flowers are roses. 
2) This test is too hard.
3) $0.6 = 0.06$
4) $\sqrt{2}$ is an ugly number.

**Write a negation for the statement.**
5) Charlie plays football.
6) That athlete wants to be a musician.
7) $x \leq 13$
8) $x > 93$
9) $x \geq -17$

Let $p$ represent the statement "Jim plays football" and let $q$ represent the statement "Michael plays basketball." Convert the compound statement into symbols.
10) Jim does not play football and Michael plays basketball.
11) Jim does not play football or Michael plays basketball.
12) It is not the case that Jim does not play football and Michael does not play basketball.
13) Jim does not play football or Michael does not play basketball.
14) Jim plays football and Michael plays basketball.

**Translate the symbolic compound statement into words.**
15) Let $p$ represent the statement "Her name is Lisa" and let $q$ represent the statement "She lives in Chicago."
$p \lor \neg q$

16) Let $p$ represent the statement "Students are males" and let $q$ represent the statement "Teachers are males."
$\neg(p \lor \neg q)$
17) Let p represent the statement "Jello is tasty" and let q represent the statement "Thursday is rectangular."
\[
\sim p \land \sim q
\]

Write a negation of the statement.
18) No fifth graders play soccer.

19) Some athletes are musicians.

Write the compound statement in symbols.
Let \( r = \) "The food is good," \( p = \) "I eat too much," \( q = \) "I'll exercise."
20) If I exercise, then I won't eat too much.
21) If the food is good or if I eat too much, I'll exercise.
22) The food is good and if I eat too much, then I'll exercise.
23) I'll exercise if I don't eat too much.
24) If I exercise, then the food won't be good and I won't eat too much.

Write the compound statement in words.
Let \( r = \) "The puppy is trained," \( p = \) "The puppy behaves well," \( q = \) "His owners are happy."
25) \( p \rightarrow r \)
26) \( r \land (p \rightarrow q) \)
27) \( \sim r \rightarrow \sim q \)
28) \( (r \land p) \rightarrow q \)

Select letters to represent the simple statements and write each statement symbolically by using parentheses then indicate whether the statement is a negation, conjunction, disjunction, conditional, or biconditional.
29) If tomorrow is not Saturday then today is Friday if and only if tomorrow is Saturday.
30) If a number is divisible by 3 and the number is not divisible by 2 then the number is not divisible by 6.
31) The lights are on if and only if it is not midnight or it is wintertime.
32) It is not true that if you take your vitamins you will stay healthy.
33) If people drive small cars then people will use less fuel and the ozone hole will not expand.
Construct a truth table for the compound statement.
34) \( r \lor \neg(s \land c) \)  
35) \( (p \land \neg t) \land q \)  
36) \( p \lor (p \land \neg p) \)  
37) \( \neg(s \lor t) \land \neg(t \land s) \)  
38) \( \neg[-(q \lor s)] \)  
39) \( (p \land s) \land \neg(s \lor t) \)  

Construct a truth table for the statement.
40) \( \neg p \rightarrow (\neg p \land t) \)  
41) \( (q \rightarrow \neg p) \rightarrow (q \land \neg p) \)  
42) \( (p \rightarrow q) \rightarrow (\neg p \lor q) \)  
43) \( \neg(p \rightarrow q) \rightarrow (p \land \neg q) \)  
44) \( (\neg p \lor \neg q) \rightarrow \neg(q \land p) \)  

Construct a truth table for the statement.
45) \( p \rightarrow q \rightarrow (\neg p \lor q) \)  
46) \( (\neg p \rightarrow q) \leftrightarrow (q \rightarrow \neg r) \)  
47) \( (\neg p \lor \neg q) \rightarrow \neg(q \land p) \)  

Use a truth table to determine whether the two statements are equivalent.
48) \( \neg(p \land q), \neg p \lor q \)  
49) \( p \lor q, \neg(\neg p \land \neg q) \)  
50) \( \neg(\neg p \rightarrow q), p \lor \neg q \)  
51) \( \neg(p \lor q) \rightarrow r, (\neg p \land \neg q) \rightarrow r \)  
52) \( (p \lor q) \lor r, p \lor (q \lor r) \)  
53) \( p \leftrightarrow (q \lor r), \neg p \rightarrow (q \land r) \)  
54) \( (p \rightarrow q) \lor (q \rightarrow p), (p \leftrightarrow q) \)
55) \((q \rightarrow p) \land (p \rightarrow q), (q \leftrightarrow p)\)

For the given direct statement, write the indicated related statement (converse, inverse, or contrapositive).

56) If I pass, then I’ll party. (contrapositive)  
57) If you like me, then I like you. (converse)  
58) If the moon is out, then we will start a campfire and we will roast marshmallows.  
   Inverse

Write the converse, inverse, and contrapositive of the given statement.

59) If you have 30 years of teaching experience, then you get your full retirement.  
60) If your IQ is between 90 and 110, you are of average intelligence. 
61) If the chores are done, then we will go to the carnival and we will eat cotton candy.  
   Contrapositive
62) If the moon is out, then we will start a campfire and we will roast marshmallows.  
   Inverse
63) If you like me, then I like you.  
   Converse
64) If \(x = 9\), then \(x^2 = 81\).  
   Converse

Write the negation of the statement.

65) \(8 + 3 = 11\) and \(9 - 3 \neq 6\)  
66) Denim is out and linen is in.  
67) Roger or Emil will attend the game.  
68) The Tigers will win their sectional match or the Wolverines will win by default.  
69) The captain of the chess team is handsome and smart.  
70) I was a day late and a dollar short.

Determine whether the argument is valid or invalid.

71) Michael Bolton is a hunk or Madonna cannot sing. If Madonna cannot sing, then Cigar does not win the Triple Crown. Cigar wins the Triple Crown. Therefore, Michael Bolton is not a hunk.
72) If Ann so wishes, then Bill will be the president. Manuel is a public defender or Bill will be the president. Manuel is not a public defender. Therefore, Ann does not so wish.

73) The Rams will be in the playoffs if and only if Ozzie is an all-star. Mark loves the Rams or Ozzie is an all-star. Mark does not love the Rams. Therefore, the Rams will not be in the playoffs.

74) If I were your friend and you were my soul mate, then I’d never stop liking you. I’ve stopped liking you. Therefore, I was not your friend or you were not my soul mate.

75) If Cathy is a gambler, then she lives in Marine. If Cathy lives in Marine, then she loves horses. Therefore, if Cathy does not love horses, then she is not a gambler.

76) If I hear that poem, then I am reminded of my mother. If I get sentimental, then I am not reminded of my mother. I get sentimental. Therefore, I don’t hear that poem.

77) Loretta’s hobby is stamp collecting. If her husband likes to fish, then Loretta’s hobby is not stamp collecting. If her husband does not like to fish, then Nathan likes to read. Therefore, Nathan likes to read.

Decide whether the argument is valid or invalid, and give the form (of valid or invalid argument) that applies.

78) If it’s Tuesday, then this must be Paris.
   Today is Wednesday. ____________________________
   This must not be Paris.

79) You get soup or you get salad.
   You did not get soup. _________________
   You got salad.

80) If the bell rings, then we answer the door.
   The bell rings. ____________________________
   We answer the door.

81) If it is cold, then you need a coat.
   You do not need a coat. _________________
   It is not cold.

82) If you read, then you will have a high score.
   You do not read. ____________________________
   You will not have a high score.

83) If the bough breaks, then the cradle will fall.
   The bough breaks. ____________________________
   The cradle will fall.

84) If you wear a tie, then you look natty.
   You do not look natty. ____________________________
   You are not wearing a tie.
Tell whether the statement is true or false.
85) $17 \notin \{16, 14, 13, \ldots, 1\}$  
86) $4 \in \{8, 12, 16, 20, 24\}$
87) $\{8\} = \{x \mid x \text{ is an even counting number between } 10 \text{ and } 16\}$
88) $15 \notin \{x \mid x \text{ is an even counting number}\}$

List all subsets or determine the number of subsets as requested.
89) Determine the number of subsets of $\{0\}$
90) Determine the number of subsets of $\{\text{mom, dad, son, daughter}\}$
91) Determine the number of subsets of $\{1, 2, 3, \ldots, 6\}$
92) List all the subsets of $\{\text{bear, cat, sheep}\}$.
93) List all the subsets of $\{0\}$.
94) List all the subsets of $\{\text{fox, cat, pig}\}$.

Let $U = \{q, r, s, t, u, v, w, x, y, z\}$
$A = \{q, s, u, w, y\}$
$B = \{q, s, y, z\}$
$C = \{v, w, x, y, z\}$. List the elements in the set.
95) $A \cap (B \cup C)$
96) $C' \cap A'$
97) $A \cup (B \cap C)$
98) $(A \cap B)'$
99) $A \cap B'$
100) $(A \cup B)'$

Let $A = \{1, 3, 5, 7\}$
$B = \{5, 6, 7, 8\}$
$C = \{5, 8\}$
$D = \{2, 5, 8\}$
$U = \{1, 2, 3, 4, 5, 6, 7, 8\}$.
Determine whether the statement is true or false.
101) $C \subseteq D$
102) $C \not\in C$
103) \( \{5\} \subseteq D \)

104) \( C \subseteq A \)

105) \( \emptyset \subseteq D \)

Solve the problem.

106) Results of a survey of fifty students indicate that 30 like red jelly beans, 29 like green jelly beans, and 17 like both red and green jelly beans. How many of the students surveyed like no green jelly beans?

107) A survey of a group of 114 tourists was taken in St. Louis. The survey showed the following:

- 65 of the tourists plan to visit Gateway Arch;
- 50 plan to visit the zoo;
- 9 plan to visit the Art Museum and the zoo, but not the gateway Arch;
- 14 plan to visit the Art Museum and the Gateway Arch, but not the zoo;
- 19 plan to visit the Gateway Arch and the zoo, but not the Art Museum;
- 9 plan to visit the Art Museum, the zoo, and the Gateway Arch;
- 15 plan to visit none of the three places.

How many plan to visit the Art Museum only?

108) A survey of 141 college students was done to find out what elective courses they were taking. Let \( A \) = the set of those taking art, \( B \) = the set of those taking basketweaving, and \( C \) = the set of those taking canoeing. The study revealed the following information.

\[
\begin{align*}
n(A) &= 45 & n(A \cap B) &= 12 \\
n(B) &= 55 & n(A \cap C) &= 15 \\
n(C) &= 40 & n(B \cap C) &= 23 \\
n(A \cap B \cap C) &= 2
\end{align*}
\]

How many students were not taking any of these electives?

109) A local television station sends out questionnaires to determine if viewers would rather see a documentary, an interview show, or reruns of a game show. There were 750 responses with the following results:

- 225 were interested in an interview show and a documentary, but not reruns.
- 30 were interested in an interview show and reruns but not a documentary.
- 105 were interested in reruns but not an interview show.
- 180 were interested in an interview show but not a documentary.
- 75 were interested in a documentary and reruns.
- 45 were interested in an interview show and reruns.
- 60 were interested in none of the three.

How many are interested in exactly one kind of show?
Answer Key
Testname: MGF_1106_SPRING_12_EXAM_1_REVIEW

1) Statement
2) Not a statement
3) Statement
4) Not a statement
5) Charlie does not play football.
6) That athlete does not want to be a musician.
7) \(x > 13\)
8) \(x \leq 93\)
9) \(x < -17\)
10) \(\neg p \land q\)
11) \(\neg p \lor q\)
12) \(\neg(\neg p \land \neg q)\)
13) \(\neg p \lor \neg q\)
14) \(p \land q\)
15) Her name is Lisa or she does not live in Chicago.
16) It is not the case that students are males or teachers are not males.
17) Jello is not tasty and Thursday is not rectangular.
18) Some fifth graders play soccer.
19) No athletes are musicians.
20) \(q \rightarrow \neg p\)
21) \((r \lor p) \rightarrow q\)
22) \(r \land (p \rightarrow q)\)
23) \(\neg p \rightarrow q\)
24) \(q \rightarrow (\neg r \land \neg p)\)
25) If the puppy behaves well then the puppy is trained.
26) The puppy is trained, and if the puppy behaves well then his owners are happy.
27) If the puppy is not trained then his owners are not happy.
28) If the puppy is trained and the puppy behaves well, then his owners are happy.
29) \((\neg p \rightarrow q) \leftrightarrow p\); biconditional
30) \((p \land \neg q) \rightarrow (\neg r)\); conditional
31) \(p \leftrightarrow (\neg q \lor r)\); biconditional
32) \(\neg(p \rightarrow q)\); negation
33) \(p \rightarrow (q \land \neg r)\); conditional
34)

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35) \[ p \quad t \quad q \quad (p \land \neg t) \land q \]

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36) \[ p \quad \neg (p \land \neg p) \]

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37) \[ s \quad t \quad \neg (s \lor t) \land \neg (t \land s) \]

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38) \[ q \quad s \quad \neg (q \lor s) \]

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39) \[ p \quad s \quad t \quad (p \land s) \land (\neg s \lor t) \]

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40) \[ p \quad t \quad \neg p \rightarrow (\neg p \land t) \]

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41) \[ q \quad p \quad (q \rightarrow \neg p) \rightarrow (q \land \neg p) \]

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42) \[ p \land q \rightarrow (p \rightarrow q) ^ \land (\neg p \lor q) \]

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43) \[ \neg(p \rightarrow q) \rightarrow (p \land \neg q) \]

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44) \[ \neg(p \land \neg q) \rightarrow \neg(q \land p) \]

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45) \[ p \land q \rightarrow \neg(p \land q) \]

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46) \[ p \land q \land r \land \neg(p \rightarrow q) \leftrightarrow (q \rightarrow \neg r) \]

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</tr>
</tbody>
</table>

47) \[ \neg(p \lor \neg q) \rightarrow \neg(q \land p) \]

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

48) Not equivalent
49) Equivalent
50) Not equivalent
51) Equivalent
52) Equivalent
53) Not equivalent
54) Not equivalent
55) Equivalent
56) If I don't party, then I didn't pass.
57) If I like you, then you like me.
58) If the moon is not out, then we will not start a campfire or we will not roast marshmallows.
59) Converse: If you get your full retirement, then you have 30 years of teaching experience. Inverse: If you do not have 30 years of teaching experience, then you do not get your full retirement. Contrapositive: If you do not get your full retirement, then you do not have 30 years of teaching experience.

60) Converse: If you are of average intelligence, then your IQ is between 90 and 110. Inverse: If your IQ is not between 90 and 110, then you are not of average intelligence. Contrapositive: If you are not of average intelligence, then your IQ is not between 90 and 110.

61) If we do not go to the carnival or we do not eat cotton candy, then the chores are not done.

62) If the moon is not out, then we will not start a campfire or we will not roast marshmallows.

63) If I like you, then you like me.

64) If \( x^2 = 81 \), then \( x = 9 \).

65) \( 8 + 3 \neq 11 \) or \( 9 - 3 = 6 \)

66) Denim is not out or linen is not in.

67) Roger will not attend the game and Emil will not attend the game.

68) The Tigers will not win their sectional match and the Wolverines will not win by default.

69) The captain of the chess team is not handsome or not smart.

70) I was not a day late or not a dollar short.

71) Invalid

72) Invalid

73) Invalid

74) Valid

75) Valid

76) Valid

77) Valid

78) Invalid; fallacy of the inverse

79) Valid; disjunctive syllogism

80) Valid; modus ponens

81) Valid; modus tollens

82) Invalid; fallacy of the inverse

83) Valid; modus ponens

84) Valid; modus tollens

85) TRUE

86) FALSE

87) FALSE

88) TRUE

89) 2

90) 16

91) 64

92) \{\text{bear}, \text{cat}, \text{sheep}\}, \{\text{bear}, \text{cat}\}, \{\text{bear}, \text{sheep}\}, \{\text{cat}, \text{sheep}\}, \{\text{bear}\}, \{\text{cat}\}, \{\text{sheep}\}, \{\emptyset\}

93) \{0\}, \{\emptyset\}

94) \{\text{fox}, \text{cat}, \text{pig}\}, \{\text{fox}, \text{cat}\}, \{\text{fox}, \text{pig}\}, \{\text{cat}, \text{pig}\}, \{\text{fox}\}, \{\text{cat}\}, \{\text{pig}\}, \{\emptyset\}

95) \{q, s, w, y\};

96) \{r, t\}

97) \{q, s, u, w, y, z\}

98) \{r, t, u, v, w, x, z\}

99) \{u, w\}

100) \{r, t, v, x\}

101) TRUE

102) TRUE

103) TRUE

104) FALSE

105) TRUE
Answer Key
Testname: MGF_1106_SPRING_12_EXAM_1_REVIEW

106) 21
107) 12
108) 49
109) 360