# MA 150 STUDY GUIDE FOR PLACEMENT TEST

MA 150, Introduction to Mathematical Reasoning, is a requirement for any student who will take a 300-level or higher math class in his major program. This may add an extra course to your schedule. Because we don't want to cause an extra stress on your schedule yet want you to be prepared for the upper level math classes, we are offering you a Math Placement test to waive this requirement. To help you be prepared for the placement test, it is suggested that you study a book called: "How to Read and Do Proofs" by Daniel Solow. There are several editions and any edition would be fine. The current edition is the 4th edition. I looked on the Internet and there were various prices for this book to buy as used. The publisher is Wiley and the ISBN is 0-471-68058-3 if a new book is desired.

This placement test will be given during the first few days of the semester during registration. You will be required to take this course unless you can pass this placement test. If you have to take MA 150 it will add an extra class to your program.

## TOPICS THAT WILL BE COVERED ON THE PLACEMENT TEST

Truth tables for conditional statements
Symbolic logic notation
Logical equivalents
Negation of logic statements
Quantifiers
Reasoning techniques such as contrapositive, contradiction, induction, deduction, cases
Properties of real numbers
Elementary set theory notation

List of symbols used on the exam.

| | |
|---|---|
| $A \rightarrow B$ | Conditional statement: If *A*, then *B*. |
| $A \leftrightarrow B$ | Biconditional statement: *A* if and only if *B.* |
| ~ | Not |
| $\wedge$ | And |
| $\vee$ | Or |
| $\forall$ | For all, every |
| $\exists$ | There exists |
| $\in$ | Element of, member of |
| $\subseteq$ | Subset |
| $\subset$ | Proper subset |
| $\ni$ | Such that |
| $\Re$ | Set of real numbers |

## SAMPLE PROBLEMS

1. "If Bill gets an A in logic, then Bill will take his classmates out to dinner." Under what conditions is this statement false?
a. Bill gets an A in logic and he takes his classmates out to dinner
b. Bill does not get an A in logic and he takes his classmates out to dinner
c. Bill does not get an A in logic and he does not take his classmates out to dinner
d. Bill gets an A in logic and he does not take his classmates out to dinner
e. None of the above

2. If statement *P* is "Mike is wearing green socks" and statement *Q* is "Pigs swim," then the following truth table represents "Mike is wearing green socks or pigs swim."

a.

| $P$ | $Q$ | $P \wedge Q$ |
|---|---|---|
| T | T | T |
| T | F | F |
| F | T | F |
| F | F | F |

b.

| $P$ | $Q$ | $P \vee Q$ |
|---|---|---|
| T | T | T |
| T | F | F |
| F | T | F |
| F | F | F |

c.

| $P$ | $Q$ | $P \vee Q$ |
|---|---|---|
| T | T | T |
| T | F | T |
| F | T | T |
| F | F | F |

d.

| $P$ | $Q$ | $P \wedge Q$ |
|---|---|---|
| T | T | T |
| T | F | T |
| F | T | T |
| F | F | F |

e. None of the above

3. If *A* is the statement "Judy is the star of the show" and *B* is the statement "Jake takes Judy out to dinner," and the ~ symbol is a negation symbol, then $A \rightarrow \sim B$ means
a. Judy is the star of the show and Jake takes her out to dinner.
b. If Judy is the star of the show then Jake will not take her out to dinner.
c. Judy is the star of the show if and only is Jake does not take her out to dinner.
d. Judy is the star of the show and Jake does not take her out to dinner.
e. None of the above

4. The statement $\sim A \to \sim B$ is logically equivalent to
a. $B \to A$
b. $A \to B$
c. $\sim A \vee B$
d. $A \wedge \sim B$
e. None of the above

5. Write the following English words in proper mathematical symbolization: "There exists a real number, *x*, such that $x - 8 = 12.$"
a. $\exists x \in \Re, \ni x - 8 = 12$
b. $\forall x \in \Re, \ni x - 8 = 12$
c. $\forall x \in \Re, \in x - 8 = 12$
d. $\forall x, \exists y \in \Re, \ni x - 8 = 12$
e. None of the above

6. $\forall a, b \in \Re, a + b = b + a$ describes what addition property of real numbers?
a. Commutative
b. Associative
c. Distributive
d. Identity
e. None of the above

7. If *A*, *B*, and *C* are sets, then $A \cup (B \cap C) =$
a. $(A \cup B) \cap C$
b. $(A \cap B) \cap (A \cap C)$
c. $(A \cup B) \cup (A \cup C)$
d. $(A \cup B) \cap (A \cup C)$
e. None of the above

8. The negation of "All cats have fleas," is
a. No cat has fleas
b. Some cats have fleas
c. Some cats do not have fleas
d. All cats do not have fleas
e. None of the above

9. When proving an "If *A*, then *B*" statement by assuming that *A* is true and *B* is false and you reason to the following conclusion 0 = 1, then the proving technique you are using is
a. Contrapositive
b. Contradiction
c. Cases
d. Deduction
e. Induction

10. If A is false and B is false then " $A \to B$ " is

a. True b. False c. Indeterminate d. More than one answer

11. If I study hard then I will get an A. I didn't get an A. What can I conclude?

a. I studied hard
b. I may have studied hard
c. I should have studied harder.
d. No conclusion is possible
e. More than one of these

12. All cows (C) eat grass (G) is symbolically written as

a. $C \to G$
b. $\exists C \wedge G$
c. $G \to C$
d. $\sim G \to C$
e. More than one of these.

**Answers**

1. D
2. C
3. B
4. A
5. A
6. A
7. D
8. C
9. B
10. A
11. C
12. A