0. BASIC MATHEMATICS: 10 multiple choice questions

Each problem has exactly ONE CORRECT ANSWER.
Please, send us your solutions by filling the boxes on the DATA PAGE.
You do not have to justify your answers in this part.

0/1. Which of the following statements is **equivalent** to the statement "A implies B" ?

a) If A is false then B is false.
b) If B is false then A is false.
c) A is true and B is false.
d) B implies A.

0/2. Which of the following statements is **true**?

a) $2.99999... < 3$
b) $2.99999... = 3$
c) $2.99999... < 3.00000...$
d) $3 < 3.00000...$

0/3. Which of the following statements is **false**?

a) The sum of two rational numbers is always rational.
b) The sum of a rational and an irrational number is always irrational.
c) The difference of a rational and an irrational number is always irrational.
d) The sum of two irrational numbers is always irrational.

0/4. Which ending makes the following statement true:

"$x > y$ implies $x^2 > 25$ if and only if..."

a) $y > 5$
b) $y \geq 5$
c) $y < 5$
d) $y \leq 5$

0/5. Which of the following statements is **true**?

a) Every nonempty set of real numbers has an upper bound.
b) A set of real numbers can have at most one upper bound.
c) Every bounded set of real numbers has exactly one upper bound.
d) Every bounded set of real numbers has exactly one least upper bound.

THIS TEST CONTINUES ON THE NEXT PAGE!

0/6. Let A and B be nonempty sets and let $f(x, y)$ be an integer valued function on $A \times B$. What is the logical connection between the following two statements?

(P) For every $a \in A$ there exists an element $b \in B$ such that $f(a, b) > 0$.
(Q) There exists an element $b \in B$ such that for every $a \in A$ we have $f(a, b) > 0$.

a) (P) implies (Q).
b) (Q) implies (P).
c) (P) and (Q) are equivalent.
d) None of the statements implies the other.

0/7. Which of the following statements is **false**?

a) The minimum of a set is always an element of the set.
b) The minimum of a set is always a lower bound of the set.
c) The infimum of a set is always an element of the set.
d) The infimum of a set is always a lower bound of the set.

0/8. Which of the following is **impossible** if $a_n \to \infty$ and $b_n \to 0$?

a) $a_n/b_n \to \infty$.
b) $a_n/b_n \to -\infty$.
c) a_n/b_n has a finite limit.
d) a_n/b_n has no finite or infinite limit.

0/9. Which if the following statements is **true**?

a) Every increasing infinite sequence of real numbers has a convergent subsequence.
b) If an infinite sequence of real numbers has no convergent subsequence then the sequence cannot be bounded.
c) Every infinite sequence of real numbers has a convergent subsequence.
d) Every subsequence of a divergent sequence of real numbers is divergent.

0/10. How many subsets A of $\{1, 2, \ldots, 10\}$ have the following property:

$$1 \in A \implies 2 \in A$$

a) 256;
b) 512;
c) 768;
d) 1024.