Proof by Induction (MIEIC-TCOM-2020-21)

* This form will record your name, please fill your name.

1. When proving a statement S(n) by induction, the base step (basis) always consider n=0 or n=1
   (1 Point)

   - TRUE
   - FALSE

2. In proof by induction, the proof for the base case(s) is not optional.
   (1 Point)

   - TRUE
   - FALSE

3. In proof by induction, we always need to prove a large number of specific cases
   (1 Point)

   - TRUE
   - FALSE

4. A proof by induction only allows us to prove theorems with equalities.
(1 Point)

- ○ TRUE
- ○ FALSE

5. When proving by induction a statement S(n) that holds for every natural number n>=0:
(1 Point)

- ○ It is correct to consider for basis n=0 and then prove S(k+1) considering the statement S(k) true
- ○ It is correct to consider for basis n=1 and then prove S(k+1) considering the statement S(k) true

6. There are statements with more than one induction variable (e.g., two or more natural numbers) that can be prooved by induction
(1 Point)

- ○ TRUE
- ○ FALSE

7. When proving by induction a statement S(n), true for every natural number n>=0, one can use as basis a large natural number and then prove S(k-1) assuming S(k) is true.
(1 Point)

- ○ TRUE
- ○ FALSE

8. Can we prove by induction that 2^n >= n+5 for n>=3?
(1 Point)

- YES
- NO

9. Can we prove by induction the statement: if x >= 4, then 2^x >= x^2 ?
(1 Point)

- NO
- YES
- Depends if x represents natural numbers or real numbers

10. In a complete binary tree of height h (not considering the leaves), the number of internal nodes (sum of all nodes in the tree except for the leaves) of that tree equals 2h-1.

Consider we want to prove the truthfulness of the above statement. Which of the following options applies?
(1 Point)

- To prove the statement we need to use the "inventor's paradox".
- We can prove the statement to be true with an induction proof, using h=0 as the base case, assuming the hypothesis valid for h, and proving for h+1.
- We cannot prove the statement to be true (of false).
- We cannot prove the statement to be true using an induction proof, as as such we can state that it is false.