socrative by MasteryConnect

Name: ______________________ **Date:** __________

Quiz name: Discrete Math Apr 13 (more cardinality)

1. Which of these techniques can be used to show that $|R|=|R^4|$?

   (A) Diagonalization / the barber of Seville paradox
   (●) Snake enumeration / space-filling curves
   (C) Power sets / towers of infinity
   (D) Disjoint unions / sums of cardinals

2. Suppose f maps X to Y and g maps Y to Z. If the composition of these two functions is a surjection, what must be true of the individual functions?

   (A) f must be surjective and g must be injective.
   (B) At least one must be a bijection.
   (C) They must both be surjections.
   (●) Only one of f and g needs to be surjective.

   Only g needs to be surjective! Example: X=Y is the integers, and Z={1}; let f(x)=x^2 and let g(y)=1 for all y. Then the first one is not surjective, but the composition is.

3. Consider the Hilbert curve H:[0,1]->[0,1]x[0,1]. Let S be the set of rational points in [0,1]. What is the cardinality of the image H(S)?

   (A) A large finite number.
   (B) Aleph-nought
   (●) c
   (D) c^2, which is bigger than c by Cantor's theorem
   (E) Undecidable; it depends on the Continuum Hypothesis.