UNIT 21 EXERCISES 1-5

LOGIC

1999 2. Which one of the following statements is false?

(A) All equilateral triangles are congruent to each other.

(B) All equilateral triangles are convex.

(C) All equilateral triangles are equiangular.

(D) All equilateral triangles are regular polygons.

(E) All equilateral triangles are similar to each other.

2017A 3. Ms. Carroll promised that anyone who got all the multiple choice questions right on the upcoming exam would receive an A on the exam. Which one of these statements necessarily follows logically?

(A) If Lewis did not receive an A, then he got all of the multiple choice questions wrong.

(B) If Lewis did not receive an A, then he got at least one of the multiple choice questions wrong.

(C) If Lewis got at least one of the multiple choice questions wrong, then he did not receive an A.

(D) If Lewis received an A, then he got all of the multiple choice questions right.

(E) If Lewis received an A, then he got at least one of the multiple choice questions right.

2004A

4. Bertha has 6 daughters and no sons. Some of her daughters have 6 daughters, and the rest have none. Bertha has a total of 30 daughters and granddaughters, and no great-granddaughters. How many of Bertha's daughters and granddaughters have no daughters?

(A) 22 **(B)** 23 **(C)** 24 **(D)** 25 **(E)** 26

2015B

4. David, Hikmet, Jack, Marta, Rand, and Todd were in a 12-person race with 6 other people. Rand finished 6 places ahead of Hikmet. Marta finished 1 place behind Jack. David finished 2 places behind Hikmet. Jack finished 2 places behind Todd. Todd finished 1 place behind Rand. Marta finished in 6th place. Who finished in 8th place?

(A) David **(B)** Hikmet **(C)** Jack **(D)** Rand **(E)** Todd

2018A

4. Alice, Bob, and Charlie were on a hike and were wondering how far away the nearest town was. When Alice said, "We are at least 6 miles away," Bob replied, "We are at most 5 miles away." Charlie then remarked, "Actually the nearest town is at most 4 miles away." It turned out that none of the three statements was true. Let d be the distance in miles to the nearest town. Which of the following intervals is the set of all possible values of d?

(A) $(0,4)$ **(B)** $(4,5)$ **(C)** $(4,6)$ **(D)** $(5,6)$ **(E)** $(5,\infty)$

2008A 5. Suppose that

$$\frac{2x}{3} - \frac{x}{6}$$

is an integer. Which of the following statements must be true about x?

(A) It is negative. **(B)** It is even, but not necessarily a multiple of 3.

(C) It is a multiple of 3, but not necessarily even.

(D) It is a multiple of 6, but not necessarily a multiple of 12.

(E) It is a multiple of 12.

2015A 5. Amelia needs to estimate the quantity $\frac{a}{b} - c$, where a, b, and c are large positive integers. She rounds each of the integers so that the calculation will be easier to do mentally. In which of these situations will her answer necessarily be greater than the exact value of $\frac{a}{b} - c$?

(A) She rounds all three numbers up.

(B) She rounds a and b up, and she rounds c down.

(C) She rounds a and c up, and she rounds b down.

(D) She rounds a up, and she rounds b and c down.

(E) She rounds c up, and she rounds a and b down.

2016A 5. Goldbach's conjecture states that every even integer greater than 2 can be written as the sum of two prime numbers (for example, $2016 = 13 + 2003$). So far, no one has been able to prove that the conjecture is true, and no one has found a counterexample to show that the conjecture is false. What would a counterexample consist of?

(A) an odd integer greater than 2 that can be written as the sum of two prime numbers

(B) an odd integer greater than 2 that cannot be written as the sum of two prime numbers

(C) an even integer greater than 2 that can be written as the sum of two numbers that are not prime

(D) an even integer greater than 2 that can be written as the sum of two prime numbers

(E) an even integer greater than 2 that cannot be written as the sum of two prime numbers