

A cryptographic code is designed as follows. The first time a letter appears in a given message it is replaced by the letter that is 1 place to its right in the alphabet (assuming that the letter A is one place to the right of the letter Z). The second time this same letter appears in the given message, it is replaced by the letter that is $1+2$ places to the right, the third time it is replaced by the letter that is $1+2+3$ places to the right, and so on. For example, with this code the word “banana” becomes “cbodqg”. What letter will replace the last letter s in the message

“Lee’s sis is a Mississippi miss, Chriss!”?

(A) g (B) h (C) o (D) s (E) t

2007 AMC 10 B, Problem #9—

“The last s is the 12th appearance of this letter in the message.”

Solution

Answer (D): The last s is the 12th appearance of this letter in the message, so it will be replaced by the letter that is

$$1 + 2 + 3 + \cdots + 12 = \frac{1}{2}(12 \cdot 13) = 3 \cdot 26$$

letters to the right of s. Since the alphabet has 26 letters, this letter s is coded as s.

Difficulty: Medium-easy

NCTM Standard: Algebra Standard: Represent and analyze mathematical situations and structures using algebraic symbols.

Mathworld.com Classification: Recreational Mathematics > Cryptograms