UNIT 18 QUESTIONS 16-20

SEQUENCE AND SERIES

1999 16. What is the radius of a circle inscribed in a rhombus with diagonals of length 10 and 24?

(A) 4 **(B)** 58/13 **(C)** 60/13 **(D)** 5 **(E)** 6

2008A 16. The numbers $\log(a^3b^7)$, $\log(a^5b^{12})$, and $\log(a^8b^{15})$ are the first three terms of an arithmetic sequence, and the 12^{th} term of the sequence is $\log(b^n)$. What is n?

(A) 40 **(B)** 56 **(C)** 76 **(D)** 112 **(E)** 143

2016B 16. In how many ways can 345 be written as the sum of an increasing sequence of two or more consecutive positive integers?

(A) 1 **(B)** 3 **(C)** 5 **(D)** 6 **(E)** 7

2008A

17. Let $a_1, a_2, \ldots$ be a sequence of integers determined by the rule $a_n = a_{n-1}/2$ if a_{n-1} is even and $a_n = 3a_{n-1} + 1$ if a_{n-1} is odd. For how many positive integers $a_1 \leq 2008$ is it true that a_1 is less than each of a_2, a_3, and a_4?

(A) 250 **(B)** 251 **(C)** 501 **(D)** 502 **(E)** 1004

2009A

17. Let $a + ar_1 + ar_1^2 + ar_1^3 + \cdots$ and $a + ar_2 + ar_2^2 + ar_2^3 + \cdots$ be two different infinite geometric series of positive numbers with the same first term. The sum of the first series is r_1, and the sum of the second series is r_2. What is $r_1 + r_2$?

(A) 0 **(B)** $\frac{1}{2}$ **(C)** 1 **(D)** $\frac{1+\sqrt{5}}{2}$ **(E)** 2

1999

20. The sequence $a_1, a_2, a_3, \ldots$ satisfies $a_1 = 19$, $a_9 = 99$, and, for all $n \geq 3$, a_n is the arithmetic mean of the first $n-1$ terms. Find a_2.

(A) 29 **(B)** 59 **(C)** 79 **(D)** 99 **(E)** 179

2010A

20. Arithmetic sequences (a_n) and (b_n) have integer terms with $a_1 = b_1 = 1 < a_2 \leq b_2$ and $a_n b_n = 2010$ for some n. What is the largest possible value of n?

(A) 2 **(B)** 3 **(C)** 8 **(D)** 288 **(E)** 2009

2010B

20. A geometric sequence (a_n) has $a_1 = \sin x$, $a_2 = \cos x$, and $a_3 = \tan x$ for some real number x. For what value of n does $a_n = 1 + \cos x$?

(A) 4 **(B)** 5 **(C)** 6 **(D)** 7 **(E)** 8