

PROBLEMS

Problem 1. If a and b are positive integers and $a^2 - b^2 = 143$, what is the value of a ?

- (A) 1 (B) 11 (C) 12 (D) 13 (E) 14

Problem 2. The lengths of the sides of a right triangle are consecutive even integers, and the length of the longer leg is x . Which of the following equations could be used to find x ?

- (A) $x + x + 1 = x + 2$ (B) $x^2 + (x + 1)^2 = (x + 2)^2$
(C) $(x - 2)^2 + x^2 = (x + 2)^2$ (D) $x - 2 + x = x + 2$
(E) $x^2 = (x - 2)(x + 2)$

Problem 3. If a and b are positive odd integers, which of the following must be a positive even integer?

- (A) $a + b$ (B) $a - b$ (C) $2a + b$ (D) $2a - b$ (E) $\frac{a+b}{2}$

Problem 4. If x and y are positive consecutive even integers, where $y > x$, which of the following is equal to $y^2 - x^2$?

- (A) $2x$ (B) $4x$ (C) $2x + 2$ (D) $2x + 4$ (E) $4x + 4$

Problem 5. If x and y are positive consecutive odd integers, where $y > x$, which of the following is equal to $y^2 - x^2 + 8$?

- (A) $6x$ (B) $8x$ (C) $2x + 2$ (D) $2x + 4$ (E) $4(x + 3)$

Problem 6. If a and b are odd integers, which of the following must also be an odd integer?

- I. $(a + 2)b$ II. $(a + 2) + b$ III. $(a + 2) - b$

- (A) I only (B) II only (C) III only (D) I and II (E) II and III

Problem 7. If t represents an odd integer, which of the following expressions represents an even integer?

- (A) $t + 4$ (B) $2t - 3$ (C) $3t - 6$ (D) $3t + 8$ (E) $5t + 5$

Problem 8. If $\frac{x+7}{2}$ is an integer. Then x must be

- (A) a negative integer (B) a positive integer (C) a multiple of 3
(D) an even integer (E) an odd integer

Problem 9. If k is a positive integer, which of the following must represent an odd integer that is twice the value of an odd integer?

- (A) $4k + 3$ (B) $2k + 3$ (C) $2k + 4$ (D) $4k + 1$ (E) $4k + 2$

Problem 10. If k is a negative even integer and n is a positive odd integer, which of the following could be equal to $n - k$?

- I. 0 II. 1 III. 3.

- (A) I only (B) II only (C) III only (D) I and III only (E) I, II, and III

Problem 11. The sum of the positive odd integers less than 1000 is subtracted from the sum of the positive even integers less than or equal to 1000. What is the resulting difference?

Problem 12. Each of the 75 children in a line was assigned one of the integers from 1 through 99 by counting off in order. Then, standing in the same order, the children counted off in the opposite direction, so that the child who was assigned the number 99 the first time was assigned the number 1 the second time. Which of the following is a pair of numbers assigned to the same child?

- (A) 50 and 48 (B) 49 and 50 (C) 66 and 33 (D) 33 and 67 (E) 45 and 32

Problem 13. The counting numbers are arranged in four columns as shown below. Under which column letter will 2012 appear?

A	B	C	D
1	2	3	4
8	7	6	5
9	10	11	12
...	14	13	

Problem 14. Suppose all the counting numbers are arranged in columns as shown below. Under what column-letter will 2012 appear?

A	B	C	D	E	F	G
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	_	_

Problem 15. Is $1 + 2 + 3 + 4 + \dots + 2011 + 2012$ even or odd?

Problem 16. Is the expression $1 \times 2 + 3 \times 4 + 5 \times 6 + \dots + 99 \times 100$ even or odd?

Problem 17. Seven lamps labeled A through G are arranged in a row. Each lamp has its own switch. Now lamps A , C , E , and G are on and other lamps are off. Ben starts to flip each switch from A to G the following way: if the lamp is on, he turns it off; if the lamp is off, he turns it on. He repeats the pattern until he flips the switches 2011 times. Which lamps are on finally?