

The Eighth Annual Catonsville Mathematics Competition

1. If S_1 equals the sum of the pairwise differences (in absolute value) of the numbers $1, 2, 3, \dots, n$ and S_2 equals the sum of squares of the pairwise differences then $S_2/S_1 =$
A) $n/2$ B) $n/3$ C) $(n + 1)/3$ D) $2^{n-1}/n$
2. The average pairwise difference of the numbers $1, 2, 3, \dots, n$ is
A) $n/2$ B) $n/3$ C) $(n + 1)/3$ D) $2^{n-1}/n$
3. Ann loves Bob, Bob loves Carol, Carol loves Dave, and Dave loves Ann. On St.Valentine's Day each person gave his or her beloved a gift worth (in dollars) the sum of the ages (in years) of the donor and the recipient of the gift. If Ann spent \$39, Bob spent \$44, and Carol spent \$47, how much did Dave spend?
A) \$36 B) \$42 C) \$46 D) \$51
4. In addition to the information in problem 3, if it is known that the sum of the ages of the girls is 37, what is Dave's age?
A) 16 B) 21 C) 23 D) 26
5. A crime was committed by one of three people, A, B, and C. A said he was guilty while B and C claimed innocence. If not all of them are truthful, exactly how many of them are lying?
A) 1 B) 2 C) 3 D) Unknown
6. The area of a regular n sided polygon with each side of length a is
A) $\frac{n}{4} a^2 \cot \frac{\pi}{n}$ B) $\frac{\sqrt{n}}{4} a^2$ C) $a^2 \sin \frac{2\pi}{n}$ D) $a^2 \tan \frac{\pi}{n}$

7. Andy went to a used book store where he sold some of his books. The number of dollars he got for each book equaled the number of books he sold, i.e., if he sold six books then he got \$6 for each. He also sold his old computer to a friend for \$275. He now went to a book store where they were having a sale, all books \$19.99 (tax included). He bought as many as he could with the money he got selling his old books and computer. He found he had only a quarter left over. How many more books does he have now than he had before he sold his old books?
- A) 5 B) 10 C) 15 D) unknown
8. An octahedron is a regular polyhedron with eight faces which are equilateral triangles. If each edge (the side of a triangle) is of length a what is the distance between two farthest vertices?
- A) $\sqrt{2} a$ B) $\sqrt{3} a$ C) $\frac{2}{\sqrt{3}} a$ D) $\sqrt{\frac{3}{2}} a$
9. What is the highest power of 3 that divides 1999! exactly?
- A) 6 B) 666 C) 729 D) 996
10. ABC is an equilateral triangle with each side of length a . If a point P moves in such a way that the sum of squares of its distances from A and B equals the square of its distance from C , then P traces a circle of radius
- A) $\frac{a}{\sqrt{2}}$ B) $\frac{a}{\sqrt{3}}$ C) a D) $\sqrt{2} a$