

January 24, 2009

Calculators are not allowed!

Circle the letter for the correct answer on the answer sheet.

- (1) Which of the following numbers is the smallest one?

A: $(2 + 0 + 0 + 9)^{(2+0+0+9)}$

B: $2^9 + 0^0 + 0^0 + 9^2$

C: $((((2009^2)^0)^0)^9)$

D: $(20 + 0 + 9)^{2009}$

E: 2009

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- (2) A handful of coins lie on a table. The number of quarters exceeds by one each of: the number of dimes, the number of nickels, and the number of pennies. What is the smallest possible amount of money on the table, if at least 10 of the coins are identical?

A: \$3.94

B: \$4.10

C: \$4.35

D: \$5.00

E: other

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- (3) Find the middle digit of the largest three-digit number in which the digit at the units is at least as large as the sum of the digits at the tens and at the hundreds.

A: 0

B: 1

C: 2

D: 8

E: 9

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- (4) What is the angle (in degrees) formed by the hour and minute hands of a perfect clock at 2:20 p.m.?

A: 30°

B: 40°

C: 50°

D: 60°

E: 120°

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- (5) Determine the number of different values represented by the expression $\pm 1 \pm 2 \pm 3 \pm 4 \pm 5$.

A: 16

B: 30

C: 31

D: 32

E: other

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- (6) The difference between certain two prime numbers is 2009. How many divisors does the sum of the two primes have?

A: 5

B: 8

C: 12

D: no such primes

E: answer not unique

- (7) A rectangular box has three faces of areas 4.5, 6 and 12. What is the volume of the box?

A: 24.5 B: 18 C: 49 D: 24 E: other

- (8) Inserting pairs of parentheses into the expression

$$1 \div 1 \div 2 \div 2 \div 3 \div 3 \div 5 \div 5 \div 7 \div 7$$

one can get various rational numbers. How many different integers are among these numbers? (Remark: If no parentheses are inserted, the division operations are performed in the same order as written, from left to right.)

A: 1 B: 4 C: 8 D: 16 E: 32

- (9) During a camping trip there were seven days when it rained either in the morning or in the afternoon, but it never rained in a morning *and* in the afternoon of the same day. There were exactly five dry mornings and six dry afternoons. How many days did the trip last?

A: 7 B: 8 C: 9 D: 10 E: 11

- (10) An arithmetic progression has the property that the sum of the first n terms is equal to the square of $2n$. What is the common difference between the consecutive terms of the progression?

A: 4 B: 6 C: 8 D: 10 E: not uniquely defined

- (11) If your expected income in a three-month period in thousands of dollars should be seven more than one-half of your age (in years), then what should your age be when you expect to earn \$20,000 in three months?

A: 17 B: 20 C: 22 D: 26 E: 27

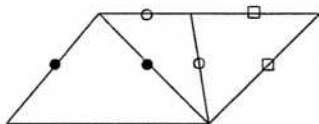
- (12) Let $x - 2y - 2 = 0$, $x - y - 6 = 0$ and $y = 0$ be the equations of the lines of the sides of a given triangle. What is the area of the triangle?

A: 4 B: 5 C: 6 D: 7 E: 8

- (13) At most how many intersection points can 10 lines have if five of them are parallel?

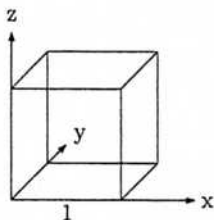
A: 35 B: 45 C: 55 D: 65 E: 100

- (21) A parallelogram can be partitioned into three isosceles triangles according to the figure below. What are the parallelogram's angles? (The parallelogram's dimensions in the drawing are distorted on purpose.)



- A: 30° and 150° B: 32° , 148° C: 36° , 144° D: 45° , 135° E: 60° , 120°

- (22) Let C be the unit cube of the first octant of the coordinate system and assume the origin is a vertex of C . What is the volume of the part of C consisting of points whose coordinates satisfy $y \leq x$ and $z \geq 1 - x$?



- A: $\frac{1}{6}$ B: $\frac{1}{3}$ C: $\frac{1}{2}$ D: $\frac{2}{3}$ E: $\frac{3}{4}$

- (23) A frog makes 10 jumps along a line each time moving forward or backward. In how many ways can the frog move 30 inches forward if the length of each jump is 5 inches long?

- A: 24 B: 36 C: 45 D: 54 E: 72

- (24) In the morning of May 1, a spider begins to climb a 30 feet tall flagpole, starting at ground level. Each morning the spider goes up three feet, and each evening it slides down two. On which day will the spider have reached the top of the pole?

- A: May 10 B: May 27 C: May 28 D: May 30 E: other

- (25) An integer lattice point in the coordinate plane is a point whose both coordinates are integers. Find the number of integer lattice points on (the circumference of) the circle of radius $\sqrt{65}$, centered at the origin.

- A: 0 B: 4 C: 12 D: 16 E: other