MOMATH
NATIONAL MUSEUM OF MATHEMATICS

Level 1

1. In how many places do we need to break a wooden stick in order to get five pieces?

   A. 3 B. 4 C. 5 D. 6
   E. It depends on how long the stick is.

2. Our class has 30 students. The number of boys is four times greater than the number of girls. How many girls are there in our class?

   A. 24 B. 16 C. 12 D. 8 E. 6

3. Instead of adding 27 to a certain number, John subtracted 27 from that number. What is the difference between John's result and the result he should have gotten?

   A. 27 B. 0 C. 54 D. 100 E. 3

4. In Grandma's pantry, there is a jar with 650 g of jam. Each day her grandson Tom eats 5 teaspoons of jam from the jar. Each teaspoon holds 6 g of jam. How much jam will there be left in the jar after 20 days?

   A. 50 g B. 530 g C. 550 g D. 1,250 g E. The jar will be empty.

5. A kangaroo wants to make a rectangular bedspread 1.5 m long and 1 m wide using square scraps which measure 10 cm x 10 cm. At every point where four squares meet she wants to place a fancy button. How many buttons will she need?

   A. 150 B. 104 C. 126 D. 140 E. 135

6. One number was chosen from the numbers 51, 52, 53, 54, and 55, and the digit 0 was placed between the digits of that number. What is the difference between the new number and the number which was chosen?

A. 500 B. 50 C. 550 D. 450
E. The difference depends on which number was chosen.

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Level 2

1. One quarter of one half of double 32 is equal to

   A. 4 B. 8 C. 16 D. 32 E. 64

2. The movie started at 1:47 PM and finished at 4:18 PM. How long was the movie?

   A. 185 min B. 151 min C. 91 min D. 149 min E. 209 min

3. A stick that in reality measures 1 m is 2 cm long in a certain picture, and in that same picture the height of a fence is 4.5 cm. What is the actual height of the fence in cm?

   A. 450 B. 225 C. 45 D. 22.5 E. 4.5

4. One bowl contained 26 liters of water and another bowl contained 7 liters of water. The same amount of water was added to each bowl, and now the second bowl contains three times less water than the first bowl. How many liters of water were added to each bowl?

   A. 2.5 B. 5 C. 7.5 D. 10 E. 15

5. Four squirrels ate 1,999 nuts altogether, and each one ate at least 100 nuts. The first squirrel ate more nuts than any other squirrel. The second and third squirrels together ate 1,265 nuts. How many nuts did the first squirrel eat?

   A. 598 B. 271 C. 629 D. 634 E. other answer

6. In each one of the five cups shown below you can find coffee, cocoa, or milk. There is twice as much coffee as cocoa. None of the beverages is poured into three cups. In which cup is the cocoa?

A. B. C. D. E.

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Level 3

1. Joanna bought a certain number of pens and pencils. Each pen cost 90 cents, and each pencil cost 40 cents. Altogether, she paid three dollars and 50 cents. How many pencils did Joanna buy?

   A. 1 B. 2 C. 3 D. 4 E. 5

2. A square piece of paper with dimensions of 10 cm x 10 cm has been divided into squares with areas of 25 cm^2. Each of these squares has been cut into two triangles. How many triangles are there?

   A. 5 B. 8 C. 9 D. 16 E. 21

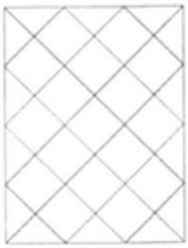
3. A soccer team consists of 11 players. The average age of the players on a certain team is 22 years old. During a game, one of the players was injured and had to leave the field. The average age of the rest of the players was then 21. How old was the injured player?

   A. 21 B. 22 C. 23 D. 32 E. 33

4. A big cube with dimensions of 9 x 9 x 9 was made out of small cubes with the dimensions of 1 x 1 x 1. The big cube was then painted. How many of the small cubes have exactly two sides painted?

   A. 84 B. 54 C. 100 D. 108 E. 478

5. The picture to the right shows a rectangular floor 3 m wide and 4 m long. To cover this floor, we used 17 square tiles and 14 triangular tiles. We want to cover a floor that has dimensions of 10 m x 20 m in the same way, with the same type of tiles. How many square tiles do we need?



   A. 200 B. 230 C. 300 D. 370 E. 400

6. In the picture below, each letter represents a digit, and different letters represent different digits. The digit 0 is not present. What is the largest possible value of the sum DREI?

$$\begin{array}{r} \text{ONE} \\ +\ \text{DEUX} \\ \hline \text{DREI} \end{array}$$

A. 9,863 B. 9,873 C. 9,874 D. 9,875 E. 9,876

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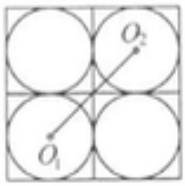
Level 4

1. I said that a certain natural number is a multiple of 2 and 5. Unfortunately, I was wrong. Which of the following statements is definitely true?

A. The number is not a multiple of 3.
B. The number is not a multiple of 7.
C. The number is not a multiple of 10.
D. The number is a multiple of 2 or 5.
E. The number is a multiple of 2 and 5.

2. The length of the side of the big square is $2a$. What is the length of the segment O_1O_2 which connects the centers of two of the circles (see the picture)?

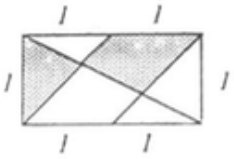


A. $2a\sqrt{2}$ B. $a\sqrt{2}$ C. $a(\sqrt{2}-1)$ D. $2a\sqrt{2}-1$
E. $a(\sqrt{2}-2)$

3. I noticed that my daughter's age would be the same as mine if the ones and the tens digits in her age were switched. Which of the following numbers can express my age at the time my daughter was born?

A. 24 B. 25 C. 26 D. 27 E. 28

4. What is the ratio of the grey area to the area of the whole rectangle?



A. $\frac{1}{4}$ B. $\frac{1}{3}$ C. $\frac{2}{5}$ D. $\frac{5}{12}$ E. $\frac{1}{2}$

5. In the set of all real numbers, how many solutions are there for the equation $2^x(6-x) = 8x$?

A. 0 B. 1 C. 2 D. 3 E. 4

6. Function f is defined for the set of all natural numbers as follows:

$$f(n) = \begin{cases} n+5, & \text{when } n \text{ is odd} \\ \dfrac{n}{2}, & \text{when } n \text{ is even} \end{cases}$$

What is the sum of the digits of the odd number k if $f(f(f(k))) = 35$?

A. 8 B. 9 C. 10 D. 12 E. 15

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Level 5

1. How many positive integers less than 1,000 can we represent as the product of two even numbers?

   A. 100 B. 150 C. 200 D. 220 E. 249

2. The perimeter of a right triangle is 18. The sum of squares of the lengths of all its sides is equal to 128. What is the area of this triangle?

   A. 18 B. 16 C. 12 D. 10 E. 9

3. Let $a = \sqrt{1+\sqrt{2+\sqrt{3+\sqrt{4+\sqrt{5+\sqrt{6}}}}}}$.

   Which of the inequalities below is true?

   A. $1 \le a < 2$ B. $2 \le a < 3$ C. $3 \le a < 4$
   D. $4 \le a < 5$ E. $5 \le a < 6$

4. The sum of the values of two out of the three roots of the polynomial $x^3 + ax^2 + bx + c$ is equal to 0. What is the value of c?

   A. $a+b$ B. $\frac{a}{b}$ C. ab D. $a-b$ E. a^b

5. On a certain inland there are two types of people, truth-tellers who always tell the truth and liars who always lie. The number of inhabitants on the island is 1,999. Each one has exactly one passion: singing, playing soccer, or fishing. Everybody has been asked three questions:

    1. Does he or she like to sing?
    2. Does he or she like to play soccer?
    3. Does he or she like fishing?

    1,000 people answered "yes" to the first question, 700 answered "yes" to the second question, and 500 people answered "yes" to the third question. How many liars are there on the island?

    A. 102 B. 180 C. 201 D. 322 E. 729

6. Function f is defined for the set of all natural numbers as follows:

$$f(n) = \begin{cases} n+5, & \text{when } n \text{ is odd} \\ \frac{n}{2}, & \text{when } n \text{ is even} \end{cases}$$

    What is the sum of the digits of the odd number k if $f(f(f(k))) = 35$?

    A. 15 B. 12 C. 10 D. 9 E.8