MO✳MATH

Level 1

1. How many triangles can you see in the picture?

    A. 2　　　　　B. 6　　　　　C. 8　　　　　D. 10　　　　　E. 12

2. What number do we need to place inside $\square$ to make $12 \times 12 \times 12 = 6 \times \square \times 6$ true?

    A. 12　　　　　B. 24　　　　　C. 48　　　　　D. 72　　　　　E. 60

3. I chose a certain number. I then subtracted 40 from it. Then I added 2,000 and, as a result, I now have 3,250. What number did I choose at the beginning?

    A. 2,040　　　　B. 1,960　　　　C. 1,290　　　　D. 3,210　　　　E. 1,250

4. Adam cut five identical square sheets of paper into two pieces. From which of the five pieces below was the piece marked with Z cut?

    A.　　　　　B.　　　　　C.　　　　　D.　　　　　E.

5. Paul was going to buy four servings of ice cream, but he was 80 cents short. So, he bought three servings and had 30 cents left. What was the price of one serving of ice cream?

    A. 70 cents　　　B. 80 cents　　C. 90 cents　　D. 1 dollar　　　E. 1 dollar and 10 cents

6. How many three-digit numbers are there that have the sum of their digits equal to 5? (For example, 122 is such a number, because 1 + 2 + 2 = 5.)

    A. 10   B. 15   C. 20   D. 25   E. 30

Level 2

1. Among the puzzle pieces below, two have the same area. Which two?

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

2. It is now the spring of 1998. The last Summer Olympics took place in 1996, and the last Winter Olympics finished just a few weeks ago. Both the Summer and Winter Olympics take place every four years. Counting both the summer and winter competitions, how many more times will the Olympics take place before March 20, 2051?

   A. 13   B. 16   C. 25   D. 26   E. other answer

3. There are stools and chairs in the room. Each stool has three legs and each chair has four legs. Altogether there are 17 legs. How many chairs are there in the room?

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

4. On Monday morning, a snail fell down a well which is 10 meters deep. During the day, it climbs up two meters, and during the night it slides down one meter. On what day of the week will the snail get out of the well?

   A. Tuesday   B. Thursday   C. Saturday   D. Sunday   E. Monday

5. What is the ones digit in the number
$$1^2 + 2^2 + 3^2 + 4^2 + 5^2 + 6^2 + 7^2 + 8^2 + 9^2 + 10^2?$$

   A. 1   B. 3   C. 5   D. 7   E. 9

6. Snow White lined up the Seven Dwarfs from shortest to tallest. She divided 77 berries among them which they had picked in the forest. The shortest dwarf got a certain number of berries, the next one got one berry more, and so on. How many berries did the tallest dwarf get?

A. 17　　　　　B. 8　　　　　C. 14　　　　　D. 10　　　　　E. 15

Level 3

1. John and Stan each have three cards marked with digits. John's cards are marked with the digits 2, 4, and 6, and Stan's cards are marked with the digits 1, 3, and 5. They are taking turns placing their cards in this diagram: ☐☐☐☐☐☐. John will fill in the first spot on the left, Stan the second spot, etc. John is trying to make the final number as small as possible, and Stan is trying to make it as large as possible. What number will they form?

    A. 123456   B. 654321   C. 254361   D. 253146   E. 253416

2. In a certain year, there were four Mondays and four Fridays in January. What day of the week was January 1 of that year?

    A. Tuesday   B. Wednesday   C. Thursday   D. Saturday   E. Sunday

3. There are three married couples. In how many ways can we form a three-person group in which there will not be a married couple?

    A. 1   B. 2   C. 6   D. 8   E. 20

4. Check the reasoning below:
    1. $x > 3$
    2. $3x > 9$
    3. $3x - x^2 > 9 - x^2$
    4. $x(3 - x) > (3 + x)(3 - x)$
    5. $x > 3 + x$
    6. $0 > 3$
    Between which steps was the mistake made?

    A. 1 and 2   B. 2 and 3   C. 3 and 4   D. 4 and 5   E. 5 and 6

5. A box shaped like a rectangular prism with dimensions of 40 cm x 25 cm x 15 cm needs to be filled with small cubes with an edge of 5 cm and larger cubes with an edge of 10 cm. What is the smallest number of cubes needed to fill the box?

A. 56 B. 58 C. 60 D. 64 E. 120

6. A piece of soap has the shape of a rectangular prism. Peter has been using it evenly, and has noticed that after 19 days, all the dimensions of the soap decreased by 1/3 of their original size. For how many more days will Peter be able to use this soap if he continues using it at the same rate?

A. 8 B. 19 C. 27 D. 38 E. other answer

Level 4

1. Two liters of a 10% salt solution have been mixed with three liters of a 15% solution of the same kind. What percentage of the mixture of these two solutions is salt?

    A. 25%   B. 5%   C. 13%   D. 12.5%   E. 12.75%

2. The square piece of paper shown in the picture is divided into three equal parts by the points marked along its edges. The sheet was folded along the dashed line. What is the shape of the area of the part common to both parts of the folded sheet?
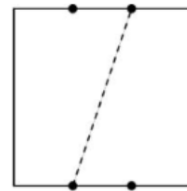
    A. parallelogram   B. pentagon   C. trapezoid
    D. triangle   E. hexagon

3. There are three non-collinear points on a plane. How many lines are there on this plane that are equidistant from all three points?

    A. 0   B. 1   C. 2   D. 3   E. infinitely many

4. Numbers x and y are three-digit numbers. x is made up of the digits 1, 2, and 3, and y is made up of the digits 4, 5, and 6. We know that $x + y$ is an even number and that the second digit of x is 2. What is the ones digit of the product of numbers x and y?

    A. 2   B. 6   C. 5   D. 4
    E. It cannot be determined with certainty.

5. Starting at the origin of a Cartesian coordinate plane, a point moves in the following way: in the first step, it moves one unit to the right, in the second step two units up, in the third step three units to the left, in the fourth step four units down, in the fifth step five units to the right, and so on. After 10 steps, at what coordinates is the point located?

   A. (-6, 6)   B. (5, 10)   C. (10, 5)   D. (5, -4)   E. (5, 6)

6. Which of the numbers below is divisible by 7 regardless of what digits P and Q represent?

   A. $QQPPQP$ B. $QPQPQP$ C. $PQPPQQ$ D. $QPPQQP$
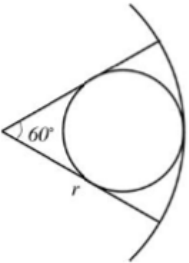   E. $PPPQQQ$

Level 5

1. What is the ones digit in the number
$1 + 1 \times 2 + 1 \times 2 \times 3 + \ldots + 1 \times 2 \times 3 \times \ldots \times 1998?$

   A. 1   B. 3   C. 5   D. 7   E. 9

2. How many natural numbers less than 1,000,000 are there where the last four digits form the number 1998?

   A. 100   B. 99   C. 101   D. 1001   E. other number

3. α and β are the solutions of the equation $x^2 + 3x - 5 = 0$. Which of the equations below has as solutions $\dfrac{1}{\alpha}$ and $\dfrac{1}{\beta}$?

   A. $x^2 + \dfrac{1}{3}x + \dfrac{1}{5} = 0$ B. $5x^2 - 3x - 1 = 0$ C. $15x^2 - x - 1 = 0$

   D. $x^2 - \dfrac{1}{3}x + 1 = 0$ E. $x^3 + 3x - \dfrac{1}{5} = 0$

4. What is the radius of a circle inscribed in a sector with a radius of r and an angle of 60°?

   A. $\dfrac{\sqrt{3}}{2}r$ B. $\dfrac{r}{2}$ C. $\dfrac{r}{3}$ D. $\dfrac{2}{3}r$ E. $\dfrac{r}{4}$

5. How many sequences of two or more consecutive natural numbers are there with a sum of 100?

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

6. If a function f satisfies the condition $(f(x))^2 = f(x^2)$ for all real values of x, then

A. function f is even   B. function f is odd

C. the function $g(x) = (f(x))^4$ is even   D. function f is nonnegative

E. the function $g(x) = (f(x))^3$ is odd