MO MATH
NATIONAL MUSEUM OF MATHEMATICS

Level 1

1. Beata has two dolls, three apples, one chocolate bar, two oranges, five peaches, and one bike. How many pieces of fruit does Beata have?

   A. 3 B. 5 C. 10 D. 18 E. 21

2. The cat says, "The length of my tail is 12 cm and half the length of my tail." How long is the cat's tail?

   A. 18 cm B. 24 cm C. 12 cm D. 9 cm E. 6 cm

3. My mom's birthday is on Sunday, and my dad's birthday is 55 days later. On what day of the week will my dad's birthday be?

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

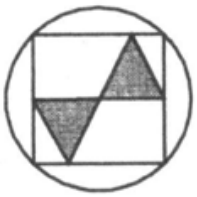
4. What is the least possible number of children in the Kowalski family if each of the children has a least one brother and at least one sister?

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

5. Peter opened a book and found that the sum of the page number on the left and the page number on the right is equal to 21. What is the product of the two page numbers?

   A. 121 B. 100 C. 420 D. 110 E. 426

6. The figure shown rotates clockwise and makes one full rotation in one hour. At 12:00 it is as shown in the picture to the right. What will it look like at 2:15?



A.

B.

C.

D.

E.

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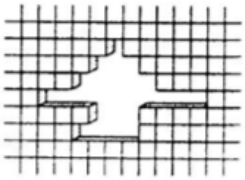
Level 2

1. 1999 - 999 + 99 - 9 =

   A. 1900 B. 1090 C. 1000 D. 1990 E. 1009

2. How many bricks were taken out from the wall shown in the picture?



   A. 26 B. 32 C. 36 D. 40 E. 42

3. John opened a book and found that the sum of the page number on the left and the page number on the right is equal to 25. What is the product of the two page numbers?

   A. 169 B. 144 C. 150 D. 156 E. 1998

4. John and Adam are making a square using small squares with the same dimensions. Adam places one red square down, and John adds eight green squares around it to make a second square. Then Adam places 16 yellow squares around this square to make a third square, and so forth. How many squares does Adam have to place to make the fifth square?

   A. 32 B. 64 C. 81 D. 121 E. 125

5. Ela came to Anna's birthday party five minutes earlier than Stan but three minutes later than Iwona. Iwona left first. She left two minutes earlier than Stan and five minutes earlier than Ela. How many minutes longer was Ela at the party than Stan?

   A. 2 B. 4 C. 6 D. 8 E. Stan stayed longer than Ela.

6. An electronic clock shows hours, minutes, and seconds. Right now it shows 19:58:47. As you can see, all the digits are different. After how many seconds will you see different digits again?

A. 40 B. 73 C. 156 D. 157 E. 898

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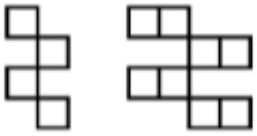
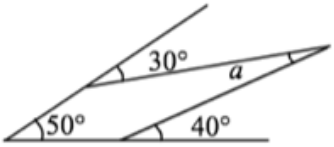
Level 3

1. In the picture, the perimeter of the figure on the left is 16 cm. What is the perimeter of the figure on the right?



A. 8 cm B. 16 cm C. 18 cm D. 24 cm E. 32 cm

2. The measure of angle a in the picture is:



A. 20° B. 25° C. 30° D. 35° E. 40°

3. If $\frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \frac{6}{5} \times \ldots \times \frac{a}{b} = 9$, then $a + b =$

A. 17 B. 18 C. 35 D. 37 E. 41

4. Which of the rectangles with dimensions listed below can we not make using figures of this shape:

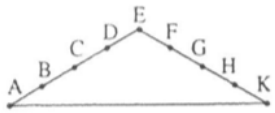
 ?

A. 4 x 4 B. 6 x 6 C. 8 x 8 D. 4 x 6 E. 6 x 8

5. We have three numbers 3^{3^3}, 3^{33}, and $(3^3)^3$. We divide the biggest of these numbers by the smallest. The quotient will be:

A 1 B. 3 C. 3^9 D. 3^{18} E. 3^{24}

6. The picture to the right shows a route up a hill and down the other side of the hill. The distances between two consecutive points are the same. Going up the hill, Peter needs the same amount of time between each two points. Going down the hill, he also needs the same amount of time between each two points, but it takes him more time to go up the hill than down the hill. Which route will take the least time?



A. C→E→G→F B. A→E→F C. D→E→K→H
D. C→E→H E. D→E→H→F

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Level 4

1. A "Kanga cube" has three faces painted red and three faces painted green. How many different "Kanga cubes" can be created?

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

2. During *Math Gym*, it takes Mary two minutes to solve each 3-point problem, three minutes to solve each 4-point problem, and five minutes to solve each 5-point problem. What is the highest score she can achieve in 15 minutes?

   A. 15 B. 20 C. 21 D. 22 E. 23

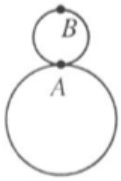
3. Function f is defined for the set of all real numbers and for any x and y it satisfies in the equation $f(x \times y) = f(x) + f(y)$. What is the value of $f(1999)$?

   A. 0 B. 1 C. 2 D. 1999 E. It cannot be determined.

4. Let a be a natural number and $a = \sqrt[3]{***9}$. What is the value of a?

   A. 29 B. 23 C. 19 D. 13 E. A different number

5. A coin with a radius r is circling around the bigger coin without sliding. Its starting position is shown in the picture. After the small coin goes around the bigger coin once, point B will end up at point A. What is the smallest possible radius of the bigger coin?



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

6. How many positive divisors are there for the number $6n$, if it is known that $2n$ has 28 positive divisors, and $3n$ has 30 positive divisors?

A. 32 B. 34 C. 35 D. 36 E. 38

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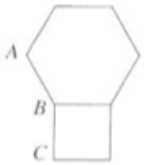
Level 5

1. The picture to the right shows a square and a regular hexagon. Segments AB and BC are the adjacent sides of a certain regular polygon. How many sides does this polygon have?



A. 18 B. 15 C. 12 D. 10 E. 8

2. If I switch the digits in the two digit-number which expresses my father's age, I will obtain a number that expresses my age. Which of the following numbers can express my father's age when I was born?

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

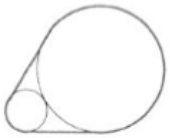
3. For how many integers n is the value of $\dfrac{2n^2+9n+13}{n+2}$ a natural number?

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

4. How many solutions are there for the equation $\Big|\,|\,|x|-1\,|-2\,|-3\,| = 2.5$?

A. 2 B. 4 C. 6 D. 8 E. 10

5. Two externally tangent circles, with diameters of 6 cm and 18 cm respectively, were bound together with a cord (see the picture). What is the length of the cord?



A. $10+20\pi$ cm B. $12\sqrt{3}+14\pi$ cm C. $13\sqrt{3}+12\pi$ cm
D. $14\sqrt{3}+11\pi$ cm E. other answer

6. Let us define the sequence $(a_2)_{n\geq 1}$ as follows:
$a = 1 \times 2 \times 3 \times 4 \times \ldots \times 1998 \times 1999 = 1999!$
a_{n+1} = sum of the digits of a_n, for $n \geq 1$
What is the value of a_{1999}?

A. 1 B. 2 C. 3 D. 6 E. 9