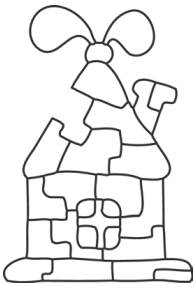
MOMATH
NATIONAL MUSEUM OF MATHEMATICS

Level 1

1. How many triangles are there in the picture?

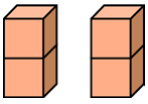
(A) 7 (B) 6 (C) 5 (D) 4 (E) 3

2. Find the missing part of the house.

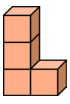
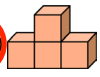
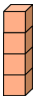


(A)  (B)  (C)  (D)  (E) 

3. Don made two bricks by stacking cubes together as shown below.

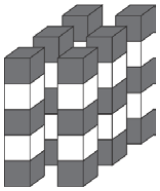


Which structure could not be built using the two bricks?

(A)  (B)  (C)  (D)  (E) 

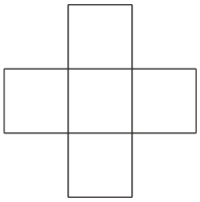
Problems selected from Kangaroo Math

4. Six towers were built with grey cubes and white cubes. Each tower was made with five cubes. Cubes of the same colors do not touch.
How many white cubes are there?



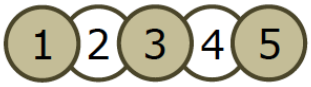
(A) 10 (B) 11 (C) 12 (D) 18 (E) 30

5. The numbers 3, 5, 7, 8, and 9 were written into the squares below so that the sum of the numbers in the row is equal to the sum of the numbers in the column.
Which number was written in the center square?



(A) 3 (B) 5 (C) 7 (D) 8 (E) 9

6. Basil attached five stickers with the digits 1, 2, 3, 4, and 5 in some order on a sheet of paper as shown in the picture.



In what order could Basil have put the stickers?

(A) 1, 2, 3, 4, 5
(B) 4, 5, 2, 1, 3
(C) 5, 4, 3, 2, 1
(D) 2, 3, 4, 1, 5
(E) 4, 1, 3, 2, 5

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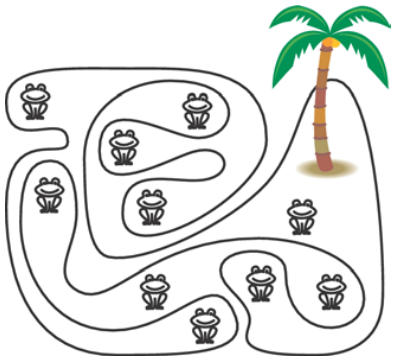
Level 2

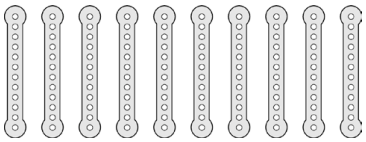
1. In the figure, we see an island with a funny shape and several frogs.



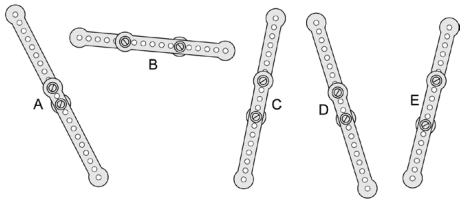
How many of these frogs are sitting on the island?

(A) 5 (B) 6 (C) 7 (D) 8 (E) 9

2. Eric had 10 equal metal strips.



He screwed pairs of them together into five long strips as shown below.



Which strip is the longest?

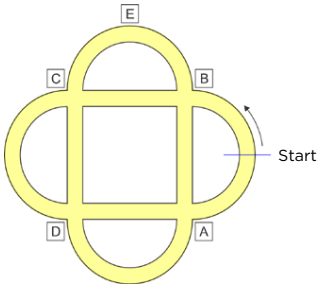
(A) A (B) B (C) C (D) D (E) E

Problems selected from Kangaroo Math

3. Betty marked 8 red points on a straight line. Then she put a blue point in each space between two neighboring red points. Finally, Betty put a green point in each space between two neighboring blue and red points. How many points did Betty mark in total?

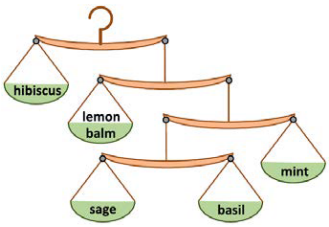
(A) 14 (B) 18 (C) 26 (D) 29 (E) 30

4. Pete rides a bicycle in a park with bike paths as shown in the figure. He starts from the ***Start*** line in the direction of the arrow. At the first crossroad he turns right, then at the next crossroad he turns left, then right again, then left again and so on, in that order. What is the sign which he will not pass?



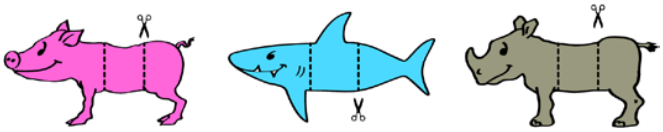
(A) A (B) B (C) C (D) D (E) E

5. To cook an elixir a witch needs five types of herbs exactly in the amounts weighed by the scales in the picture. The witch knows that she needs to put 5 grams of sage into the elixir. How many grams of hibiscus does she have to use? (The weight of the scales is irrelevant.)



(A) 50 g (B) 40 g (C) 30 g (D) 20 g (E) 10 g

6. Tom drew a shark, a pig, and a rhino and cut each of them in three pieces as shown.



Then he made different animals by combining one head, one middle part, and one bottom. How many different real or fantasy animals could Tom create in total?

(A) 3 (B) 9 (C) 15 (D) 24 (E) 27

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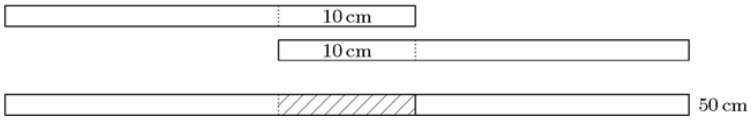
Level 3

1. There are ten ducks. Five of these ducks each lay an egg every day. The other five ducks each lay an egg every second day. How many eggs in total do the ten ducks lay in a period of 10 days?

   (A) 75 (B) 60 (C) 50 (D) 25 (E) 10

2. Alva has 4 paper strips of the same length. She glues 2 of them together with a 10 cm overlap, and gets a strip 50 cm long.



   With the other two paper strips, she wants to make a 56 cm long strip. How long should the overlap be?

   (A) 4 cm (B) 6 cm (C) 8 cm (D) 10 cm (E) 12 cm

3. A rectangle has an area of 12 cm^2. Its sides are of integer lengths in centimeters. Which of the following values could be the perimeter of the rectangle?

   (A) 20 cm (B) 26 cm (C) 28 cm (D) 32 cm (E) 48 cm

4. In a four-digit number $\overline{ABCD}$ the digits A, B, C, and D are in increasing order from left to right. What is the largest possible difference $\overline{BD} - \overline{AC}$ of the two-digit numbers $\overline{BD}$ and $\overline{AC}$?

   (A) 86 (B) 61 (C) 56 (D) 50 (E) 16

5. In a bag there are 3 green apples, 5 yellow apples, 7 green pears, and 2 yellow pears. Simon is randomly taking fruits out of the bag one by one. How many fruits must he take out in order to be certain that he has at least one apple and one pear of the same color?

   (A) 9 (B) 10 (C) 11 (D) 12 (E) 13

Problems selected from Kangaroo Math

6. In how many ways can you place the three kangaroos in three different cells, out of the seven cells below, so that no two kangaroos are neighbors?

(A)7 (B) 8 (C) 9 (D) 10 (E) 11

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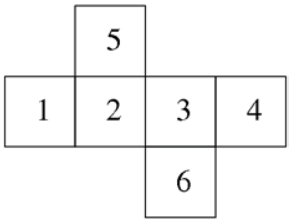
Level 4

1. The net of a cube with numbered faces is shown in the diagram. Sasha correctly adds the numbers on opposite faces of this cube. What three totals does Sasha get?



(A) 4, 6, 11 (B) 4, 7, 10 (C) 5, 6, 10 (D) 5, 7, 9 (E) 5, 8, 8

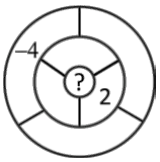
2. A soccer club owns five identical mowers. It takes 10 hours to mow the grass of the soccer field using two of the mowers. How long does it take to mow the grass of the same field using all five mowers?

(A) 7 hours (B) 6 hours (C) 5 hours (D) 4 hours (E) 3 hours

3. Every asterisk in the equation $2*0*1*5*2*0*1*5*2*0*1*5=0$ is to be replaced with either + or − so that the equation is correct. What is the smallest number of asterisks that must be replaced with +?

(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

4. Ria wants to write a number in each of the seven bounded regions in the diagram. Two regions are neighbors if they share part of their boundary. The number in each region is to be the sum of the numbers in all its neighbors. Ria has already written in two of the numbers, as shown. What number must she write in the central region?



(A) 1 (B) −2 (C) 6 (D) −4 (E) 0

Problems selected from Kangaroo Math

5. In the trapezoid $PQRS$, the sides PQ and SR are parallel. Angle RSP is 120° and $RS = SP = \frac{1}{3}PQ$.
   What is the size of the angle PQR?

   (A) 15° (B) 22.5° (C) 25° (D) 30° (E) 45°

6. Five positive integers (not necessarily all different) were written on five cards. Peter calculated the sum of the numbers on every pair of cards. He obtained only three different totals, 57, 70, and 83. What is the largest of the five integers on the cards?

   (A) 35 (B) 42 (C) 48 (D) 53 (E) 82

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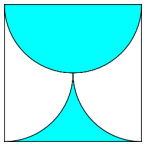
Level 5

1. The shaded part of the square with side a is bounded by a semicircle and two quarter arcs. What is its area?

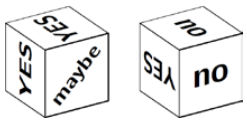


(A) $\frac{\pi a^2}{8}$ (B) $\frac{a^2}{2}$ (C) $\frac{\pi a^2}{2}$ (D) $\frac{a^2}{4}$ (E) $\frac{\pi a^2}{4}$

2. Which of the following is neither a square number nor a cube number?

(A) 6^{13} (B) 5^{12} (C) 4^{11} (D) 3^{10} (E) 2^9

3. The picture shows my decision die in two different positions.



What is the probability of rolling YES with this die?

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) $\frac{5}{9}$ (D) $\frac{2}{3}$ (E) $\frac{5}{6}$

4. If the two roots of the equation $x^2 - 85x + c = 0$ are prime numbers, what is the value of the sum of the digits of c?

(A) 12 (B) 13 (C) 14 (D) 15 (E) 21

5. How many 2-digit numbers can be written as the sum of exactly six different powers of 2, including 2^0?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

6. When one of the numbers $1, 2, 3, \ldots, n-1, n$ was eliminated, the average of the remaining numbers was 4.75. Which number was eliminated?

(A) 5 (B) 7 (C) 8 (D) 9
(E) This is impossible to determine.

Problems selected from Kangaroo Math

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Level 6

1. How many solutions does the equation $2^{2x} = 4^{x+1}$ have?

   (A) 0 (B) Infinitely many (C) 2 (D) 1 (E) 3

2. A drinking glass has the shape of a truncated cone (see figure). The outside of the glass (without the base) will now be covered with colored paper. What shape does the paper need to be in order to cover the whole glass completely without overlaps?

   (A) rectangle 

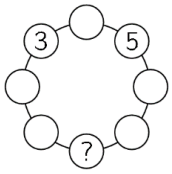
   (B) trapezoid 

   (C) circle sector 

   (D) parallel strip 

   (E) part of a circle sector 

3. Ella wants to write a number in each circle in the picture such that each number is the sum of its two neighbors. Which number must Ella write in the circle with the question mark?



   (A) −5 (B) −16 (C) −8 (D) −3 (E) This is impossible.

4. An automobile dealer bought two cars. He sold the first one for 40% more than he paid for it and the second one for 60% more than he paid for it. The money he received for the two cars was 54% more than what he paid for both. The ratio of the prices the dealer paid for the first and the second car was:

   (A) 10:13 (B) 20:27 (C) 3:7 (D) 7:12 (E) 2:3

Problems selected from Kangaroo Math

5. In each of the cells of a square $n \times n$ $(n > 3)$ table a number is written so that the sums along all rows and columns of the table are the same. Furthermore, not all numbers are equal. Find the largest possible number of equal values in the table's cells.

   (A) $(n-1)^2$ (B) $n(n-1)$ (C) n^2-4 (D) n^2-3 (E) n^2-1

6. A piece of paper has the shape of an equilateral triangle. What is the minimum number of straight lines parallel to its sides that divide the triangle into at least 100 regions?

   (A) 16 (B) 25 (C) 36 (D) 81 (E) 100