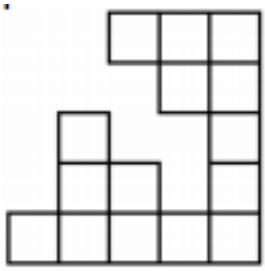
MO MATH
NATIONAL MUSEUM OF MATHEMATICS

# Level 1

(please share this page and work on scratch paper)

1. A square was made of 25 small squares, but some of these small squares were lost. How many small squares were lost?



(A) 6 (B) 7 (C)8 (D) 10 (E) 12

2. Alan is five years old. His sister Bethany is seven years older than him. What is the sum of their ages?

(A) 11 (B) 12 (C) 13 (D) 15 (E) 17

3. Which of the shapes below should be placed on top of the shape  to make a rectangle?

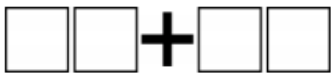
(A)  (B)  (C)  (D) 

(E) 

4. Mary has 13 flowers, five of which are roses. The rest are tulips. Six of the flowers are white, and the remaining flowers are red. At least how many tulips are red?

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

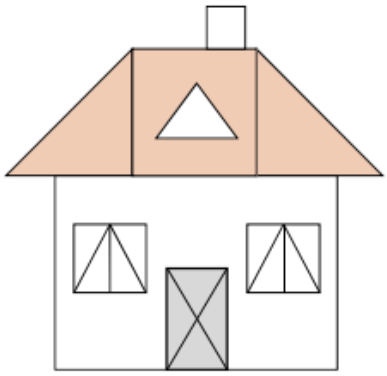
5. Place the digits 2, 3, 4, and 5 in the squares so that the sum is as large as possible. What is this sum?



(A) 68 (B) 77 (C) 86 (D) 95 (E) 97

*Problems selected from Kangaroo Math*

6. How many triangles are there in the picture?



(A) 15 (B) 17 (C) 19 (D) 21 (E) 25

MOMATH
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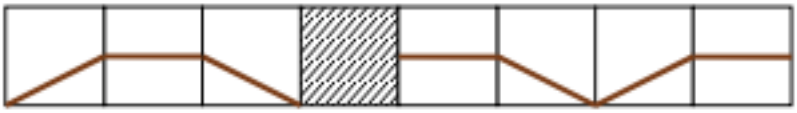
# Level 2

(please share this page and work on scratch paper)

1. Jacky wants to insert the number 3 somewhere between the digits of the number 2014, to make a five-digit number that is as small as possible. Where should Jacky insert the number 3?

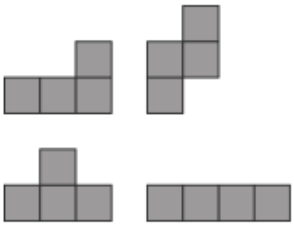
   (A) in front of 2014
   (B) between the 2 and the 0
   (C) between the 0 and the 1
   (D) between the 1 and the 4
   (E) at the end of 2014

2. Which tile must be in the shaded square so that the line is connected?

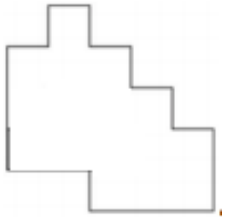


(A) 
(B) 
(C) 
(D) 
(E) 

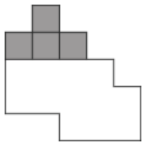
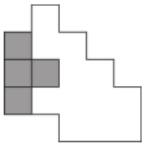
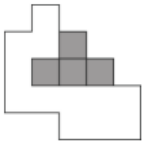
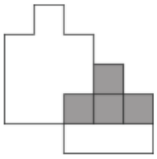
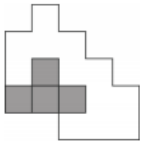
3. Ann has four pieces as shown.



With these pieces she can completely cover the shape:

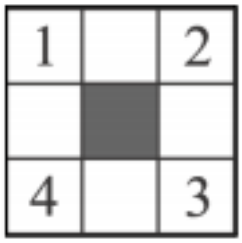


Where should she put the piece  ?

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

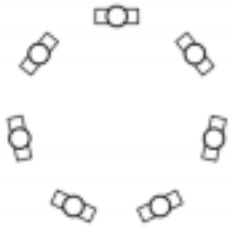
*Problems selected from Kangaroo Math*

4. Nick has written each of the numbers from 1 to 9 in the cells of the 3 × 3 table. Only four of these numbers can be seen in the figure. Nick has noticed that for the number 5, the sum of the numbers in the neighboring cells equals 13 (neighboring cells are cells sharing a side). He noticed the same applies to the number 6. Which number has Nick written in the shaded cell?




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

5. Seven children are standing in a circle. No two boys are standing next to each other. No three girls are standing next to each other. How many girls are there standing in the circle?



(A) only 3 (B) 3 or 4 (C) only 4 (D) 4 or 5 (E) only 5

6. A soccer coach is selecting a team amongst players who are from 20 to 35 years old. At least how many players should be selected for the team so that, for certain, two players are of the same age?

(A) 14 (B) 15 (C) 16 (D) 17 (E) 20

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# Level 3

(please share this page and work on scratch paper)

1. Two big rings – one grey, one white – are linked to each other. Peter, in front of the rings, sees the rings as in the picture:

Paul is behind the rings. What does he see?

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

2. Harry participated in a broom flight contest which consisted of five laps. The times when Harry passed the starting point are shown in the table. Which lap took the shortest time?

| | Time |
|---|---|
| start | 09:55 |
| after lap 1 | 10:26 |
| after lap 2 | 10:54 |
| after lap 3 | 11:28 |
| after lap 4 | 12:03 |
| after lap 5 | 12:32 |

(A) the first (B) the second (C) the third (D) the fourth
(E) the fifth

3. Henry and John started walking from the same point. Henry went 1 km north, 2 km west, 4 km south and finally 1 km west. John went 1 km east, 4 km south and 4 km west. Which of the following must be the final part of John's walk so that he could reach the same point as Henry?

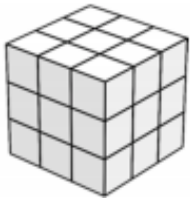
(A) He has already reached the same point. (B) 1 km north.
(C) 1 km north-west. (D) More than 1 km north-west. (E) 1 km west.

4. A plane takes off from Vienna at 11:00 am local time and arrives in Toronto at 1:00 pm local time. On average, it takes 8 hours for a plane of this type to fly this distance. What time is it in Toronto when it is 7:00 am in Vienna?

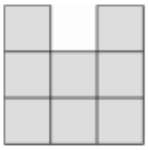
(A) 1:00 pm (B) 1:00 am (C) 9:00 am (D) 5:00 am
(E) 3:00 pm

*Problems selected from Kangaroo Math*

5. The 3×3×3 cube in the picture is made of 27 small cubes.

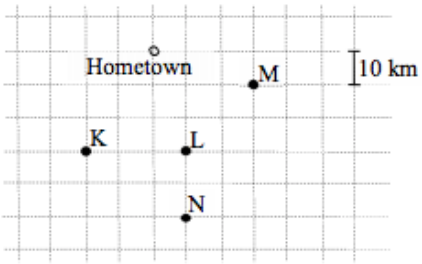


How many small cubes do you have to remove to see the following result when viewing from the right, from above, and from the front?



(A) 4 (B) 5 (C) 6 (D) 7 (E) 9

6. Bob is going to visit four cities. He will start from and end up in his home town. The figure shows a map of the regions with the cities. The roads are only along the grid lines.




Bob wants to make the trip as short as possible. Which route should Bob follow?

(A) M,L,N,K (B) K,L,M,N (C) N,M,L,K (D) L,N,K,M
(E) K,L,N,M

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# Level 4

(please share this page and work on scratch paper)

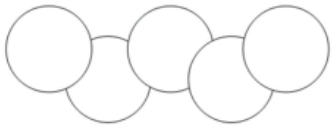
1. What is the result of: 2014 × 2014 ÷ 2014 – 2014?

   (A) 0 (B) 1 (C) 2013 (D) 2014 (E) 4028

2. Which of the following calculations gives the largest result?

   (A) 44 × 777 (B) 55 × 666 (C) 77 × 444 (D) 88 × 333
   (E) 99 × 222

3. In the diagram, the area of each circle is 1 cm². The area common to two overlapping circles is $\frac{1}{8}$ cm². What is the area of the region covered by the five circles?



   (A) 4 cm² (B) $\frac{9}{2}$ cm² (C) $\frac{35}{8}$ cm² (D) $\frac{39}{8}$ cm²
   (E) $\frac{19}{4}$ cm²

4. The average of two positive numbers is 30% less than one of them, and X% more than the second one. What is the value of X?

   (A) 75 (B) 70 (C) 30 (D) 25 (E) 20

5. Liz and Mary competed in solving problems. Each of them received the same list of 100 problems. For any problem, the girl who solved the problem first got 4 points, whereas the girl who solved the problem second got 1 point. Liz solved 60 problems and Mary also solved 60 problems. Together, they got 312 points. How many problems were solved by both of them?

   (A) 53 (B) 54 (C) 55 (D) 56 (E) 57

*Problems selected from Kangaroo Math*

6. Ten children are lined up from tall to small. They have to be lined up from small to tall. This will be achieved by a number of interchanges of two children next to each other. How many interchanges are needed?

(A) 9 (B) 10 (C) 25 (D) 45 (E) 90

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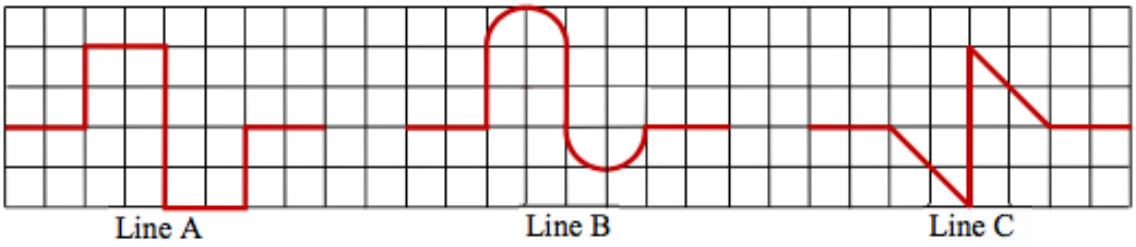
# Level 5

(please share this page and work on scratch paper)

1. If $a$, $b$, and $c$ denote the lengths of the lines A, B and C in the picture, then which of the following statements is correct?




(A) $a < b < c$ (B) $a < c < b$ (C) $b < a < c$ (D) $b < c < a$
(E) $c < b < a$

2. In a certain village, the ratio between the number of adult men and the number of adult women is 2 : 3 and the ratio between the number of adult women and the number of children is 8 : 1. What is the ratio between the number of adults (men and women) and the number of children?

(A) 5 : 1 (B) 10 : 3 (C) 13 : 1 (D) 12 : 1 (E) 40 : 3

3. In the picture, there is a special die. Numbers on the opposite faces always make the same sum. The numbers that we cannot see in the picture are all prime numbers. Which number lies opposite to 14?


(A) 11 (B) 13 (C) 17 (D) 19 (E) 23

4. The average of 5 consecutive numbers is 100. What is the average of the three largest of these numbers?

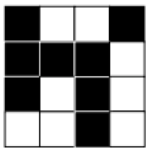
(A) 99 (B) 100 (C) 101 (D) 102 (E) 303

*Problems selected from Kangaroo Math*

5. On the picture shown Kaan wants to add some line segments such that each of the seven points has the same number of connections to other points. What is the least number of line segments Kaan must draw?

(A) 4 (B) 5 (C) 6 (D) 9 (E) 10

6. The cells of the 4 × 4 table are colored black and white as shown in the figure. In one move, one must recolor three arbitrarily chosen cells in their opposite colors. Find the least possible number of moves one needs to get a table which is colored in the chess-board pattern.



(A) 1 (B) 2 (C) 3 (D) 4 (E) it is impossible to do

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# Level 6

(please share this page and work on scratch paper)

1. Carla, Emilie and Lilia have a birthday today. The sum of their ages is now 44. What will the sum of their ages be the next time it is a two-digit number with two equal digits?

   (A) 55 (B) 66 (C) 77 (D) 88 (E) 99

2. In the number 2014 the digits are different and the last digit is greater than the sum of the other three digits. How many years ago did this occur the last time?

   (A) 5 (B) 215 (C) 305 (D) 395 (E) 485

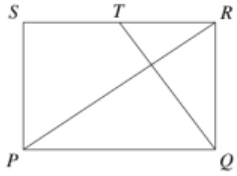
3. In a soccer match, the winner gets 3 points, the loser gets 0 points, while in the case of a draw each team gets 1 point. Four teams *A*, *B*, *C*, *D*, take part in a soccer tournament. Each team plays three games: one against each other team. At the end of the tournament team *A* has 7 points and teams *B* and *C* have 4 points each. How many points does team *D* have?

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

4. The number of intersection points of four distinct straight lines on the plane cannot be equal to

   (A) 6. (B) 5. (C) 4. (D) 3. (E) 2.

5. *PQRS* is a rectangle. *T* is the midpoint of *RS*. *QT* is perpendicular to the diagonal *PR*. What is the ratio *PQ* : *QR*?




   (A) 2 : 1 (B) $\sqrt{3}$ : 1 (C) 3 : 2 (D) $\sqrt{2}$ : 1 (E) 5 : 4

6. The equalities $k = (2014 + m)^{\frac{1}{n}} = 1024^{\frac{1}{n}} + 1$ are given for positive integers *k*, *m*, *n*. How many different values can the number *m* take?

   (A) None (B) 1 (C) 2 (D) 3 (E) Infinitely many

*Problems selected from Kangaroo Math*