

Kangourou Sans Frontières

Mathematics Promotion Society

Math Kangaroo in USA

Math Kangaroo 2012 in USA

International Competition in Mathematics

Thursday, March 15, 2012

Levels 5 and 6

This test consists of 30 questions on 4 pages.

You have 75 minutes to complete it.

Calculators are not allowed!

Please enter your answers on the answer form provided.

Please put your name and ID number on the line below.

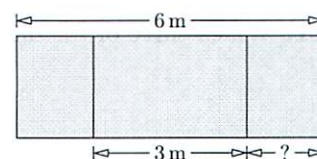
3 Point Problems

1. Basil wants to paint the slogan VIVAT KANGAROO on a wall. He wants to paint different letters different colors, and the same letters the same color. How many colors will he need?

- A) 7 B) 8 C) 9 D) 10 E) 13

2. A blackboard is 6 m wide. The width of the middle part is 3 m. The two other parts have equal width. How wide is the right-hand part?

- A) 1 m B) 1.25 m C) 1.5 m D) 1.75 m E) 2 m



3. Sally can put 4 coins in a square made using 4 matches (see picture). At least how many matches will she need in order to make a square containing 16 coins that do not overlap?

- A) 8 B) 10 C) 12 D) 15 E) 16



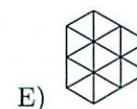
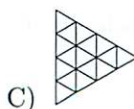
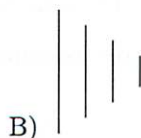
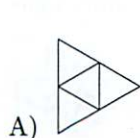
4. On a certain plane, the rows are numbered from 1 to 25, but there is no row number 13. Row number 15 has only 4 passenger seats; all the other rows have 6 passenger seats. How many seats for passengers are there on this plane?

- A) 120 B) 138 C) 142 D) 144 E) 150

5. When it is 4 o'clock in the afternoon in London, it is 5 o'clock in the afternoon in Madrid and it is 8 o'clock in the morning on the same day in San Francisco. Ann went to bed in San Francisco at 9 o'clock yesterday evening. What was the time in Madrid at that moment?

- A) 6 o'clock yesterday morning B) 6 o'clock yesterday evening
C) 12 o'clock yesterday afternoon D) 12 o'clock midnight
E) 6 o'clock this morning

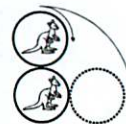
6. The picture to the right shows a pattern of hexagons. We draw a new pattern by connecting all the midpoints of neighboring hexagons. Which of the figures below do we get?



7. To the number 6 we add 3. Then we multiply the result by 2 and then we add 1. Then the final result will be the same as the result of the computation

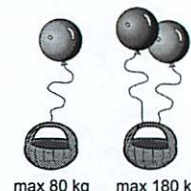
- A) $(6 + 3 \times 2) + 1$ B) $6 + 3 \times 2 + 1$ C) $(6 + 3) \times (2 + 1)$ D) $(6 + 3) \times 2 + 1$ E) $6 + 3 \times (2 + 1)$

8. The upper coin is rotated without slipping around the fixed lower coin to a position shown in the picture. Which is the resulting relative position of kangaroos?



- A) B) C) D) E) depends on the rotation speed

9. One balloon can lift a basket containing items weighing at most 80 kg. Two such balloons can lift the same basket containing items weighing at most 180 kg. What is the weight of the basket?



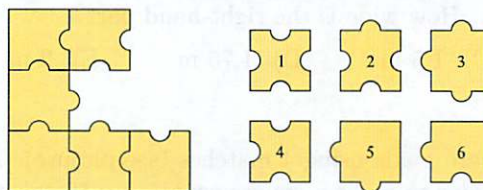
- A) 10 kg B) 20 kg C) 30 kg D) 40 kg E) 50 kg

10. Vivien and Mike were given some apples and pears by their grandmother. They had 25 pieces of fruit in their basket altogether. On the way home Vivien ate 1 apple and 3 pears, and Mike ate 3 apples and 2 pears. At home they found out that they brought home the same number of pears as apples. How many pears were they given by their grandmother?

- A) 12 B) 13 C) 16 D) 20 E) 21

4 Point Problems

11. Which three of the numbered puzzle pieces should you add to the picture to complete the square?



- A) 1, 3, 4 B) 1, 3, 6 C) 2, 3, 5 D) 2, 3, 6 E) 2, 5, 6

12. Lisa has 8 dice with the letters A, B, C and D, with the same letter on all sides of each die. She builds a block with them. Two adjacent dice always have different letters. What letter is on the die that cannot be seen in the picture?



- A) A B) B C) C D) D E) It is impossible to say.

13. There are five cities in Wonderland. Each pair of cities is connected by one road, either visible or invisible. On the map of Wonderland, there are only seven visible roads, as shown. Alice has magical glasses: when she looks at the map through these glasses she only sees the roads that are otherwise invisible. How many invisible roads can she see?

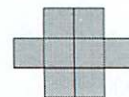


- A) 9 B) 8 C) 7 D) 3 E) 2

14. The positive integers have been colored red, blue or green: 1 is red, 2 is blue, 3 is green, 4 is red, 5 is blue, 6 is green, and so on. Renate calculates the sum of a red number and a blue number. What color can the resulting number be?

- A) impossible to say B) red or blue C) only green D) only red E) only blue

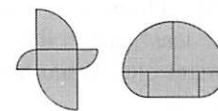
15. The perimeter of the figure to the right, made up of identical squares, is equal to 42 cm. What is the area of the figure?



- A) 8 cm^2 B) 9 cm^2 C) 24 cm^2 D) 72 cm^2 E) 128 cm^2

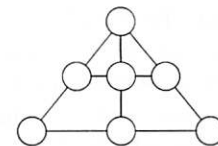
16. Look at the pictures. Both shapes are formed from the same five pieces. The rectangle measures 5 cm \times 10 cm, and the other parts are quarters of two different circles. The difference between the lengths of the perimeters of the two shapes is

- A) 2.5 cm B) 5 cm C) 10 cm D) 20 cm E) 30 cm



17. Place the numbers from 1 to 7 in the circles in such a way that the sum of the numbers on each of the indicated lines of three circles is the same. What is the number at the top of the triangle?

- A) 1 B) 3 C) 4 D) 5 E) 6

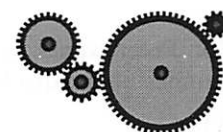


18. A rubber ball falls vertically through a height of 10 m from the roof of a house. After each impact on the ground it bounces back up to $\frac{4}{5}$ of the previous height. How many times will the ball appear in front of a rectangular window whose bottom edge is at a height of 5 m and whose top edge is at a height of 6 m?

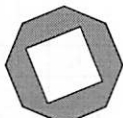
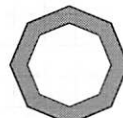
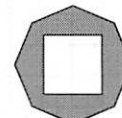
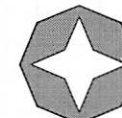
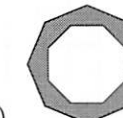
- A) 3 B) 4 C) 5 D) 6 E) 8

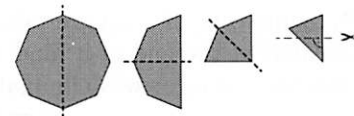
19. There are 4 gear wheels on fixed axles next to each other, as shown. The first one has 30 gears, the second one 15, the third one 60 and the last one 10. How many revolutions does the last gear wheel make when the first one turns through one revolution?

- A) 3 B) 4 C) 6 D) 8 E) 9



20. A regular octagon is folded in half exactly three times until a triangle is obtained, as shown. Then the apex is cut off at a right angle, as shown in the picture. If the paper is unfolded, what will it look like?

- A)  B)  C)  D)  E) 



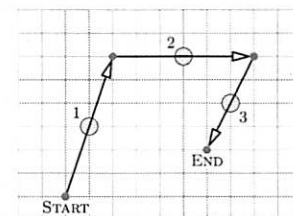
5 Point Problems

21. Winnie's vinegar-wine-water marinade contains vinegar and wine in the ratio of 1 to 2, and wine and water in the ratio of 3 to 1. Which of the following statements is true?

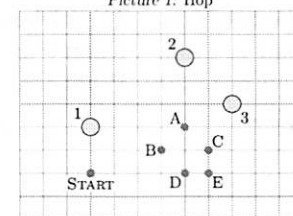
- A) There is more vinegar than wine.
B) There is more wine than vinegar and water together.
C) There is more vinegar than wine and water together.
D) There is more water than vinegar and wine together.
E) There is less vinegar than either water or wine.

22. Kangaroos Hip and Hop play jumping by hopping over a stone, then landing across so that the stone is the midpoint of the segment traveled during each jump. Picture 1 shows how Hop jumped three times hopping over stones marked 1, 2 and 3. Hip has the configuration of stones marked 1, 2 and 3 (to jump over in this order), but starts in a different place as shown on Picture 2. Which of the points A, B, C, D or E is his landing point?

- A) A B) B C) C D) D E) E



Picture 1: Hop

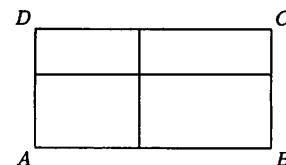


Picture 2: Hip

23. There were twelve children at a birthday party. Each child was either 6, 7, 8, 9 or 10 years old, with at least one child of each age. Four of them were 6 years old. In the group the most common age was 8 years old. What was the average age of the twelve children?

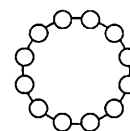
- A) 6 B) 6.5 C) 7 D) 7.5 E) 8

24. Rectangle $ABCD$ is cut into four smaller rectangles, as shown in the figure. The four smaller rectangles have the properties: (a) the perimeters of three of them are 11, 16 and 19; (b) the perimeter of the fourth is neither the biggest nor the smallest of the four. What is the perimeter of the original rectangle $ABCD$?



- A) 28 B) 30 C) 32 D) 38 E) 40

25. Kanga wants to arrange the twelve numbers from 1 to 12 in a circle in such a way that any neighboring numbers always differ by either 1 or 2. Which of the following pairs of numbers have to be neighbors?



- A) 5 and 6 B) 10 and 9 C) 6 and 7 D) 8 and 10 E) 4 and 3

26. Peter wants to cut a rectangle of size 6×7 into squares with integer sides. What is the smallest number of squares he can get?

- A) 4 B) 5 C) 7 D) 9 E) 42

27. Some cells of a square table of size 4×4 were colored red. The number of red cells in each row was indicated at the end of it, and the number of red cells in each column was indicated at the bottom of it. Then the red color was eliminated. Which of the following tables can be the result?

- A)

 $\begin{matrix} 4 \\ 2 \\ 1 \\ 1 \end{matrix}$ B)

 $\begin{matrix} 1 \\ 2 \\ 1 \\ 3 \end{matrix}$ C)

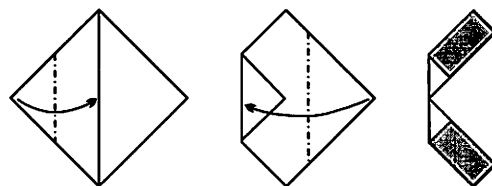
 $\begin{matrix} 3 \\ 3 \\ 0 \\ 0 \end{matrix}$ D)

 $\begin{matrix} 2 \\ 1 \\ 2 \\ 2 \end{matrix}$ E)

 $\begin{matrix} 0 \\ 3 \\ 3 \\ 1 \end{matrix}$

28. A square-shaped piece of paper has an area of 64 cm^2 . The square is folded twice as shown in the picture. What is the sum of the areas of the shaded rectangles?

- A) 10 cm^2 B) 14 cm^2 C) 15 cm^2 D) 16 cm^2 E) 24 cm^2



29. Abid's house number has 3 digits. Removing the first digit of Abid's house number, you obtain the house number of Ben. Removing the first digit of Ben's house number, you get the house number of Chiara. Adding the house numbers of Abid, Ben and Chiara gives 912. What is the second digit of Abid's house number? (In this problem, the digit 0 cannot be the first digit of a house number.)

- A) 3 B) 4 C) 5 D) 6 E) 0

30. I give Ann and Bill two consecutive positive integers (for instance 7 to Ann and 6 to Bill). They know their numbers are consecutive, they know their own number, but they do not know the number I gave to the other one. Then I heard the following discussion: Ann said to Bill: "I don't know your number." Bill said to Ann: "I don't know your number." Then Ann said to Bill: "Now I know your number! It is a divisor of 20." What is Ann's number?

- A) 2 B) 3 C) 4 D) 5 E) 6