Kangourou Sans Frontières

Math Kangaroo USA 2025

International Competition in Mathematics
Thursday, March 20, 2025

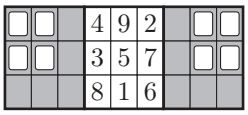
Math Kangaroo USA

Grades 9 and 10

You have 75 minutes to complete the test. ⋆ Calculators are not allowed. ⋆ Mark your answers on the answer sheet.

Problems 3 points each

1. The trifold leaflet shown below includes transparent windows, allowing what is below to be clearly seen when the flaps are folded over. We fold over the left flap and then the right flap. What is the sum of the numbers that can be seen through the windows?



(**A**) 7 (**B**) 9 (**C**) 12 (**D**) 14 (**E**) 15

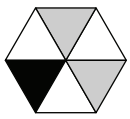
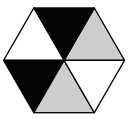
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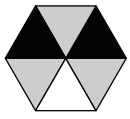
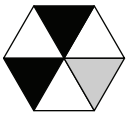
2. The base of a triangle increases by 50% and its height decreases by one-third. What is the ratio of the area of the new triangle to that of the original triangle?

(**A**) 2:1 (**B**) 1:1 (**C**) 1:2 (**D**) 1:3 (**E**) 1:4

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3. In which of the following hexagons is exactly one-third of the area black and exactly half of the area white?

(**A**)  (**B**)  (**C**) 

(**D**)  (**E**) 

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4. Kangaroo Day takes place every year on the third Thursday of March. Which date is the earliest possible day for Kangaroo Day?

(**A**) March 14 (**B**) March 15 (**C**) March 20
(**D**) March 21 (**E**) March 22

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5. A recipe requires 1 cup of rice and $1\frac{1}{2}$ cups of water. Rouven wants to use $1\frac{1}{2}$ cups of rice. How many cups of water does he need?

(**A**) 1 (**B**) $1\frac{1}{4}$ (**C**) $1\frac{3}{4}$ (**D**) $2\frac{1}{4}$ (**E**) $2\frac{1}{2}$

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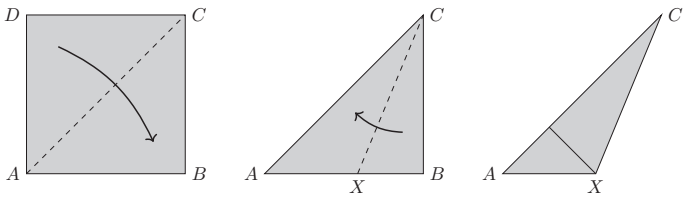
6. Lisa has four wooden digits. She can use them to form the number 2025. How many different numbers greater than 2025 can she form with these digits?

2025

(**A**) 3 (**B**) 6 (**C**) 8 (**D**) 9 (**E**) 11

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7. Alex folds a square in half along a diagonal to make a triangle. Then he folds the paper again so that one of the short edges of this triangle lies on top of the long edge of this triangle, making the smaller triangle AXC as shown. What is the measure of angle AXC?



(**A**) 108° (**B**) 112.5° (**C**) 120°
(**D**) 145° (**E**) 157.5°

8. The 4-digit number 80□□ is missing its last two digits. The number is divisible by 8 and 9. What is the product of these two missing digits?

(**A**) 6 (**B**) 16 (**C**) 20 (**D**) 24 (**E**) 48

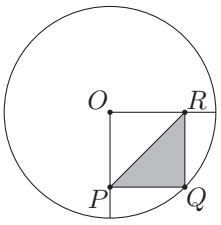
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9. Luka has some dogs, some rabbits, and some cats. Eight of his pets are not dogs. Five of his pets are not rabbits. Seven of his pets are not cats. How many pets does Luka have?

(**A**) 10 (**B**) 11 (**C**) 15 (**D**) 16 (**E**) 20

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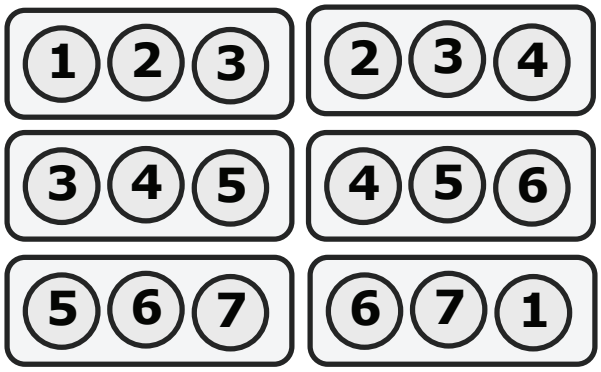
10. A circle with center O and a radius of 10 cm is given. A square $OPQR$ is drawn inside the circle, where Q is a point on the circle. What is the area of the shaded triangle PQR?



(**A**) 12.5 cm^2 (**B**) 25 cm^2 (**C**) 50 cm^2
(**D**) 75 cm^2 (**E**) 100 cm^2

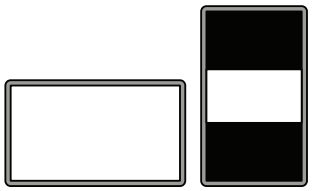
Problems 4 points each

11. An athlete has a collection of two gold and five silver medals. They are numbered from 1 to 7, in some order. The figure shows black and white photos of the medals. It is known that in each photo exactly one of the medals is gold. What is the sum of the numbers on the two gold medals?



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

12. Anna looks at a photo on her smartphone. The format is 16 : 9 and fills the whole display. When she turns the smartphone, the picture gets smaller. What fraction of the display area is taken up by the smaller picture?



(**A**) $\frac{3}{4}$ (**B**) $\frac{9}{16}$ (**C**) $\frac{27}{64}$ (**D**) $\frac{32}{81}$ (**E**) $\frac{81}{256}$

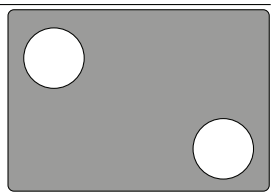
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13. Kate and Tom are celebrating their birthdays today. Tom notices that $\frac{1}{19}$ of Kate's age is equal to $\frac{1}{17}$ of his age. The sum of their ages is greater than 40 and less than 100. How old is Kate?

(**A**) 19 (**B**) 34 (**C**) 38 (**D**) 57 (**E**) 76

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14. Paul shoots a total of 27 times at two targets. He hits 50% of the shots he aims at the top left target and 80% of the shots he aims at the bottom right target. He misses a total of 9 shots. How many times did he aim for and hit the top left target?



(**A**) 4 (**B**) 5 (**C**) 6 (**D**) 7 (**E**) 8

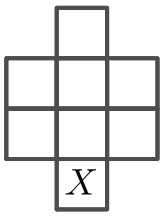
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15. Sara has a bag of 18 balls, numbered from 1 to 18. What is the smallest number of balls Sara should remove in order to guarantee that she has removed at least three balls with prime numbers on them?

(**A**) 11 (**B**) 12 (**C**) 13 (**D**) 14 (**E**) 15

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16. David wants to place the numbers 1 to 8 in the eight cells of the diagram, with one number in each cell. He wants the cells that contain two consecutive numbers not to share a side or a vertex. Which numbers can David put in cell marked X?



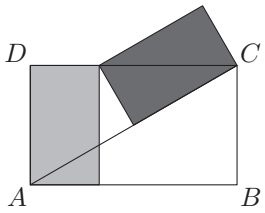
(**A**) 1 or 8 (**B**) 2 or 7 (**C**) 3 or 6
(**D**) 4 or 5 (**E**) 7 or 8

17. The number N is the largest six-digit integer with the product of all its digits equal to 180. What is the sum of the digits of N?

(**A**) 21 (**B**) 22 (**C**) 23 (**D**) 24 (**E**) 25

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18. The two shaded rectangles are congruent. Each of the shaded rectangles has an area of 4. What is the area of the large rectangle $ABCD$?



(**A**) 10 (**B**) $8\sqrt{3}$ (**C**) 8
(**D**) 12 (**E**) $4\sqrt{3}$

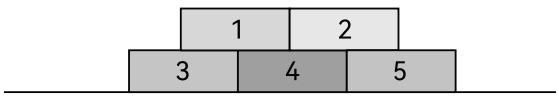
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19. The product of three prime numbers is 11 times their sum. What is the largest possible value of their sum?

(**A**) 14 (**B**) 17 (**C**) 21 (**D**) 25 (**E**) 26

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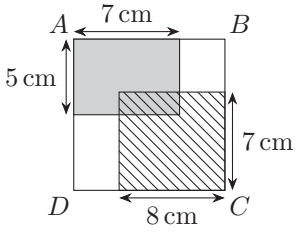
20. Five bricks are placed on the ground, as shown. Peter can only remove a brick if there are no bricks on top of it. He selects one of the available bricks at random and removes it, until all the bricks are removed. What is the probability that the brick numbered 4 is the third brick to be removed?



(**A**) $\frac{1}{3}$ (**B**) $\frac{1}{4}$ (**C**) $\frac{1}{5}$ (**D**) $\frac{1}{6}$ (**E**) $\frac{1}{8}$

Problems 5 points each

21. The square $ABCD$ contains two rectangles. One is gray and the other striped, with dimensions as shown in the diagram (not to scale). The area of the overlapping part of the two rectangles is 18 cm^2. What is the perimeter of $ABCD$?



(**A**) 28 cm (**B**) 34 cm (**C**) 36 cm
(**D**) 38 cm (**E**) 40 cm

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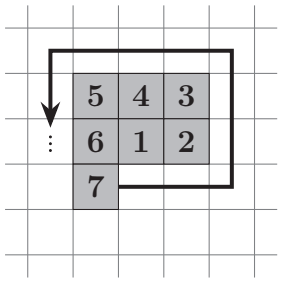
22. A four-digit integer $\overline{ABCD}$ is multiplied by its units digit $\overline{D}$. The result is a different four-digit integer $\overline{DXYA}$, which has the units and thousands digits of the original integer interchanged. How many four-digit integers $\overline{ABCD}$ have this property?

$$\begin{array}{r} A\ B\ C\ D \\ \times \qquad D \\ \hline D\ X\ Y\ A \end{array}$$

(**A**) 1 (**B**) 2 (**C**) 9 (**D**) 10 (**E**) 11

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23. Daniel numbers certain squares on a sheet of grid paper. Each square has a side length of 0.5 cm. He starts with the first square and then numbers the squares $2, 3, 4, 5, \ldots$ in a counter-clockwise direction, as shown. He stops when he has numbered 2025 squares, and looks at the figure made up of all the numbered squares. What is the perimeter of this figure?



(**A**) 25 cm (**B**) 45 cm (**C**) 80 cm
(**D**) 90 cm (**E**) 180 cm

24. $\overline{ABCDEF}$ is a six-digit number made up of the digits 1, 2, 3, 4, 5, and 6, with no repeated digits. Its first two digits $\overline{AB}$ is multiple of 2, its first three digits $\overline{ABC}$ is multiple of 3, its first four digits $\overline{ABCD}$ is multiple of 4, its first five digits $\overline{ABCDE}$ is multiple of 5, and the full integer $\overline{ABCDEF}$ is a multiple of 6. What is the sixth digit, F?

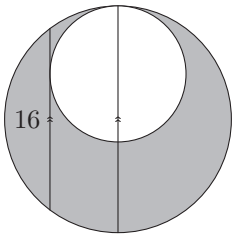
(**A**) 2 (**B**) 4 (**C**) 6

(**D**) Both 2 and 4 are possible.

(**E**) Both 4 and 6 are possible.

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25. In the diagram below, the diameter of the inner circle forms part of the diameter of the outer circle. The outer circle has a chord of length 16 that is parallel to its diameter and is also a tangent to the inner circle. What is the area of the shaded region?



(**A**) 36π (**B**) 49π (**C**) 64π (**D**) 81π

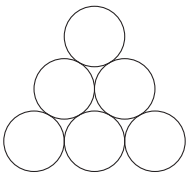
(**E**) The information provided is not sufficient.

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26. A sequence of numbers $a_1, a_2, a_3, a_4, \ldots, a_{10}$ is such that from the third term on, each term is equal to the mean of all the previous terms. That is, a_3 is the mean of a_1 and a_2; a_4 is the mean of a_1, a_2, and a_3; and so on. In this sequence $a_1 = 8$ and $a_{10} = 26$. What is the value of a_2?

(**A**) 28 (**B**) 32 (**C**) 38 (**D**) 44 (**E**) 50

27. Six circles are arranged in the shape of a triangle, as shown. John writes the digits from 1 to 6 inside the circles so that the sums of the numbers in the circles on all three sides of this triangle are the same. He then calculates the sum of the numbers in the three circles at the vertices of the triangle. How many possible values could he obtain for this sum?



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

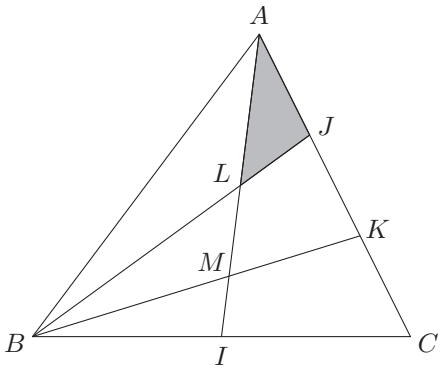
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28. At a party, there are twelve children, including three pairs of twins. How many ways are there to distribute six blue hats and six red hats to the children so that in each pair of twins both children are wearing hats of the same color?

(**A**) 72 (**B**) 86 (**C**) 92 (**D**) 102 (**E**) 132

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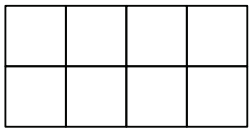
29. Triangle ABC has an area of 60. Point I is the midpoint of side BC, and the points J and K divide side AC into three equal segments. Point L is the intersection of AI and BJ. Find the area of triangle ALJ.



(**A**) 4 (**B**) 5 (**C**) 6 (**D**) 7 (**E**) 8

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30. Anastasia wants to write the numbers from 1 to 8 into the cells of a 2×4 grid. The number in each cell must be smaller than the number in the cell to its right and smaller than the number in the cell below it. In how many different ways can Anastasia fill the grid?



(**A**) 6 (**B**) 8 (**C**) 10 (**D**) 12 (**E**) 14