KMMC 2

Karate Masters Mathematics Competitions 2

3rd Annual

KMJJIME

Saturday, September 28, 2024

INSTRUCTIONS

1. Please don't open this booklet until you start the test.
2. This is a 15-question competition. All answers are whole numbers from 00 to 99 (including 00 and 99). Please make sure to put a 0 as the first digit for all single-digit answers! (For example, if your answer is 1, please write 01.)
3. Answer the problems by typing your answers on the KMJJIME Answer Form with a keyboard. Check the keys for accuracy and erase errors and stray marks completely.
4. SCORING: You will receive 1 point for each correct answer, 0 points for each problem left unanswered, and 0 points for each incorrect answer.
5. You can only use blank scratch paper, rulers, and erasers. Don't use anything else! No problems on the competition will require the use of a calculator.
6. Figures are not necessarily drawn to scale.
7. Before beginning the competition, your competition manager will not ask you to record your name and other information on the answer sheet.
8. You will have 50 minutes to complete the competition once you start the test.
9. When you finish the competition, don't sign your name in the space provided on the answer sheet.

If we find out you cheated, we will remove your score.

Please don't send the problems to someone else or talk about the problems before the contest is over, as it is cheating.

1. Taiki, Katherine, and Ryan all take a test with 10 problems. Taiki and Ryan each get 6 problems right. If exactly 2 people solved each problem on the test, find the number of problems that Katherine got right.

2. Frusciante and Satake each have 5 golden rings. In one turn, Frusciante can choose to give Satake exactly 2 rings, or Satake can choose to give Frusciante exactly 3 rings. (A person must have enough rings to give rings.) Find the fewest possible number of turns before Satake has 0 rings.

3. Cindy has a list of five consecutive whole numbers. She chooses three of them, doubles them, adds them together, and gets 70. She adds the other two numbers and gets 25. Find the smallest number in Cindy's original list.

4. Karate and Judo are waiting in line for their driver's licenses. There are 34 people between Karate and Judo. In addition, there are 42 people in front of Judo, and 50 people behind Karate. There are at least $\triangle$ people in the line and at most $\square$ people in the line. Find $\square - \triangle$.

5. Kondosare's bakery sells two types of orders: 3 chocolate and 11 vanilla, and 10 chocolate and 4 vanilla. One day, she sells 15 orders, and 122 of the cupcakes are vanilla. Find how many chocolate cupcakes she sells.

6. Let $\square$, $\triangle$, $\diamond$ be numbers such that

$$\begin{aligned} \square + \diamond &= 5 \\ \square \times \triangle &= 16 \\ \diamond \times \triangle &= 19. \end{aligned}$$

   What is $\square + \triangle + \diamond$?

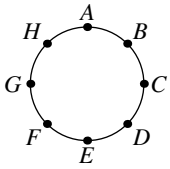
7. Chika has four different whole numbers. She sees that

   - exactly 1 of them is a multiple of 5,
   - exactly 2 of them are even, and
   - exactly 3 of them are one-digit numbers.

   If the sum of the numbers is 18, and the largest number is 9 more than the smallest, find the product of the other two numbers.

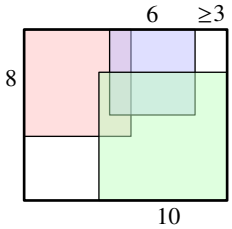
8. Ryan is conducting a survey of people who own cats, dogs, or both cats and dogs. He finds that $\frac{2}{5}$ of people with cats own dogs and $\frac{1}{6}$ of people with dogs own cats. The fraction of people in the survey that own both cats and dogs can be written in simplest terms as $\frac{\star}{\diamond}$. Find $\star + \diamond$.

9. Eight equally spaced points lie on the circumference of a circle and are labeled A, B, C, D, E, F, G, and H in clockwise order. Karate draws segments connecting any two different points together. Then, Judo erases every segment that connects two points, both of which are either A, B, E, or G. Find how many segments are not erased.



10. Kaguya has a red and a blue cup with equal amounts of liquid. Each cup has a mix of water and juice. If Kaguya pours 35% of the red cup and 80% of the blue cup into a pitcher, then the pitcher would contain 54% juice. If Kaguya pours 65% of the red cup and 20% of the blue cup into a pitcher, then the pitcher would contain 36% juice. If Kaguya pours all the liquid into one pitcher, then the pitcher would contain □% juice. Find □.

11. Three squares are placed inside a larger rectangle. Taiki wants to extend the sides of the rectangle and shift the squares so that none of the three squares overlap. He wants the blue square to remain at least 3 units away from the right side of the rectangle, and he wants the red square to remain completely to the left of the blue square. Find the least possible perimeter of the rectangle.



12. The first digit of a number is 8. After multiplying the number by 6, the first digit of the resulting number is 5. Find the number of possible values for the next two digits of the original number.

13. Ana and Matsuri are taking turns removing cards from a stack of 37 cards. Ana goes first, and on each turn, Ana always removes from 3 to 5 cards from the stack, and Matsuri always removes 4 cards from the stack. At some point, after Ana takes her turn, there are exactly 4 cards left. Find the number of different ways that this could happen.

14. Torako has three rectangular strips of felt, whose areas sum to 87. She overlaps them so that the region covered by at least one strip of felt forms a square of side length 8. If the area covered by three strips of felt is 1, find the area covered by exactly two strips of felt.

15. Anko, Noko, Torako, Chiharu, and Kinu are counting in a circle. Anko starts from 1, and they continue to count in a circle. Chiharu will skip every other of her turns. (For example, when Torako says 8, Chiharu will skip her turn and Kinu will say 9.) In addition, Kinu will skip every third of her turns. Find the first two digits of the 2024th number Chiharu says.

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KMJJIME

DO NOT OPEN UNTIL SATURDAY, September 28, 2024

****Administration on an earlier date will disqualify your results.****

- All the information is not contained in the non-existent KMJJIME Teacher's Manual. PLEASE READ THE MANUAL BEFORE SATURDAY, SEPTEMBER 28, 2024.
- Please don't send the problems to someone else or talk about the problems before the contest is over, as it is cheating.
- Please submit your answers to the Quilgo form if you are taking the 10-minute challenge mode.
- To take the traditional, 50-minute test, start the Quilgo and open the test link. You can just close out the Quilgo afterwards without submitting it. Instead, you have 50 minutes to send a private message on AoPS to **DeToasty3**, **pandabearcat**, **PandaMC**, and **pog**.

For more information about the KMJJIME and our other competitions, please visit *Wait, we don't have a website!*

Questions and comments about this competition should be sent to:

DeToasty3, **pandabearcat**, **PandaMC**, and **pog**.

The KMJJIME contest was written by the KMMC 2 Committee:

DeToasty3, pandabearcat, PandaMC, & pog