KMMC 2

Karate Masters Mathematics Competitions 2

2nd Annual

KMJJIME I

Saturday, January 7, 2023

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. Today is Karate's birthday. To celebrate, he decides to buy a cake and 20 candles. If he splits the cake into 6 pieces and puts 3 candles on 5 of the pieces, find the greatest number of candles he can put on the sixth piece.

2. Azusa, Ui, and Jun have 120 dollars in total. Jun has as many dollars as Azusa and Ui combined, and Azusa and Ui have the same number of dollars. Find the total number of dollars Ui and Jun have.

3. Mio has two boxes, each with 15 pencils. After Yui, Ritsu, and Mugi each take two pencils from either box, one of the boxes has 11 pencils left. Find the number of pencils the other box has left.

4. Karate is having a party. He sends out an invitation to his 3 friends, and then each of his friends send out an invitation to 2 of their other friends. Find the number of people that are invited to the party, other than Karate.

5. There are 6 people in a line. The first person says a number, and then each person says the sum of the numbers of the previous people. If the 5th person in the line says 8, find the number that the 6th person will say.


6. A certain 2-digit number can be written as the sum of two one-digit numbers, but not as the sum of two *different* one-digit numbers. Find this number.

7. When Aki first started solving math problems, he could solve 25 problems in 110 minutes. Now, he can solve 30 problems in 42 minutes. Find how many minutes faster in which he can solve one problem.

8. Azusa has two different positive whole numbers that multiply to 32. If she adds 21 to the smaller number and adds 12 to the larger number, then the distance between the new numbers on a number line would be 5. Find the sum of all possible sums of the original numbers.

9. An octagon, shown below, has side lengths 3, 4, 3, and 4, and the other four sides of the octagon have equal lengths. Given that the area of the shaded rectangle is equal to 18, find the area of the octagon.
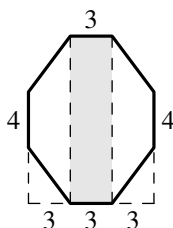
10. Ritsu is playing a video game. To beat the game, she must press the A, B, and X buttons twice each. However, if she ever presses the X button twice in a row, then she loses. Find the number of ways for Ritsu to beat the game.

11. Karate, Judo, and Aki each choose a whole number. If Karate's number is twice Judo's number, Aki's number is four more than Karate's number, and the product of Judo and Aki's numbers is divisible by 21, find the smallest possible sum of Karate, Judo, and Aki's numbers.

12. Mio writes a whole number on a piece of paper. Each minute, she erases the number on the paper, randomly adds either 1, 2, or 3 to the number, doubles the resulting sum, and writes the result. After four minutes, Mio writes the number 780. Find the smallest number Mio could have started with.

13. Mugi has two equilateral triangles with side lengths 6 and 2 that meet at a vertex and a side. On Karate's birthday, she rests a regular hexagon-shaped balloon exactly on the sides of both triangles. After Karate's birthday, the balloon deflates while keeping its shape until at some point, the perimeter of the combined shape is $27\frac{1}{3}$. Find the perimeter of the balloon at that point.
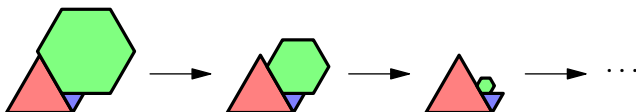
14. Yui picks 5 whole numbers each from 1 to 35, inclusive, where any two numbers are at least 4 apart. If three of the numbers Yui picked are 16, 21, and 30, find how many ways Yui could have picked the other two numbers.

15. Doremy and Cirno are playing a game on a 4×4 grid. Cirno wins the game if she can draw a 2×2 square with no red squares inside it. Find the last two digits of the number of ways for Doremy to color 10 squares on the grid red so that it is possible for Cirno to win the game.
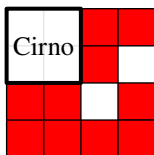
KMJJIME I

DO NOT OPEN UNTIL SATURDAY, January 7, 2023

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, JANUARY 7, 2023.

- 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