MATHCOUNTS®

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2023 Chapter Competition
Team Round Problems 1–10

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School ______________________________

Team Members ______________________________, Captain

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DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This section of the competition consists of 10 problems which the team has 20 minutes to complete. Team members may work together in any way to solve the problems. Team members may talk to each other during this section of the competition. This round assumes the use of calculators, and calculations also may be done on scratch paper, but no other aids are allowed. All answers must be complete, legible and simplified to lowest terms. The team captain must record the team's official answers on his/her own competition booklet, which is the only booklet that will be scored. If the team completes the problems before time is called, use the remaining time to check your answers.

Total Correct	Scorer's Initials

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1. ______________ kè

In dynastic China, a kè was a unit of time measuring $\frac{1}{4}$ of one hour. How many kè are in one (non-leap) year?

2. ______________ buses

The students at Somerset School are going on a field trip. There will be 270 students and 24 teachers on the trip. Each bus can carry 42 passengers. How many buses will be needed?

3. ______________

An *abundant* number is a number for which the sum of its positive proper factors is greater than the number itself. For example, because the sum of the positive proper factors of 24 is 36, it follows that 24 is an abundant number. What is the least abundant number greater than 24?

4. ______________ residents

The town of Heterochromia has 1200 residents. Each resident has two eyes, and each eye is green, blue or brown. If 400 residents have at least one green eye, 600 residents have at least one blue eye, and 900 residents have at least one brown eye, how many residents have two eyes of the same color?

5. ______________

The exam scores of twenty-four students are in the stem-and-leaf plot shown, where 7|2 represents 72 points. Two students, Erica and Makawee, took the test late, and Makawee earned 6 points more than Erica. It turns out that when Erica's and Makawee's scores are included with the other twenty-four, the overall average does not change. What was Makawee's score on the exam?

Stem	Leaf
5	8
6	7
7	0 2 2 4 4 5 6 6 8 8 8
8	0 0 5 5 8 9
9	2 2 3 3 5

6. ______________ Veronica runs on a treadmill for 1 minute at 5 mi/h. She increases her speed by x mi/h and runs for 30 seconds, and then she decreases her speed back to 5 mi/h and runs for 1 minute. Veronica continues in this manner, alternating between the slower speed for 1 minute and the faster speed for 30 seconds. Assume that all changes in speed are instantaneous. She stops when she has reached 5 miles, which occurs after exactly 55 minutes. What is the value of x? Express your answer as a decimal to the nearest tenth.

7. ______________ triangles How many different non-congruent right triangles with integer side lengths have a perimeter less than 75?

8. ______________ units^2 ABCD is a quadrilateral with AB = 3, BC = 4, CD = 12 and AD = 13. If AB $\perp$ BC and AC $\perp$ CD, what is the least possible area of ABCD?

9. ______________ Pete rolls three fair six-sided dice. Given that the sum of the three numbers rolled is 9, what is the probability that all the dice showed different numbers? Express your answer as a common fraction.

10. ______________ integers How many two-digit positive integers have exactly three positive one-digit factors?