OMMC 2025 Main Round

OMMC Staff

May 2025

HOW TO SUBMIT

1. During the testing period, go to our official test portal: https://ommc-test-portal-2025.vercel.app/. **One person submits per team.** Teams can have 1 to 4 people, inclusive.

2. Register an account using Google or Discord.

3. Fill out team registration information and answers.

4. Submit your answers and all answers and information will be saved to your account. **The submission and your registration information are to be sent in TOGETHER.**

5. You can access this information, and **send in an updated submission if you choose,** if you sign back in to your account later within the testing period. **We will take the last set of answers submitted.**

NO, you do not need to "sign up" beforehand in the conventional sense. Just sign into the test portal **ANYTIME DURING THE TESTING PERIOD and SEND IN A RESPONSE.**

RULES

1. This is a **25-question, untimed examination** that can be worked on by a team of up to 4 people. Only one person from each team has to submit answers. If we receive multiple submissions from a team, the most recent submission will be graded.

2. All answers are positive rational numbers inputted as "a/b" for relatively prime positive integers a, b where $b > 1$, or nonnegative integers. Your score will be the number of correct answers; there is neither partial credit nor a penalty for wrong answers. Top scoring teams will move onto the final round.

3. No aids other than writing utensils, scratch paper, rulers, compasses, erasers, and a **four-function/scientific calculator** are allowed. The use of **graphing calculators, smartphones, smartwatches, and/or outside websites is NOT ALLOWED**. In particular, **Desmos, Geogebra, Wolfram Alpha, and other similar websites are forbidden**. Failure to follow this rule will result in your test score being voided.

4. Discussion of any aspect of the test outside your team is **not allowed** until submissions are closed and discussion is opened. Failure to follow this rule will result in your test score being voided.

5. Submissions open on **May 17th, 2025, 9:00 AM EDT** and close at **May 24th, 2025, 11:59 PM EDT**.

6. Diagrams are not necessarily to scale.

Any questions on the above should be emailed to ommcofficial@gmail.com. With that, good luck! The OMMC team has spent a lot of time on this contest and we hope that you enjoy your experience.

PROBLEMS

1. There are 25 balls in a row. Their colors from left to right are red, green, blue, red, green, blue, and so on. Each red ball is worth 3 points. Each green ball is worth 2 points. Each blue ball is worth 1 point. Find the sum of points of these 25 balls.

2. The lengths of two of the sides of a parallelogram are 40 and 50 respectively. The difference between the lengths of its two heights is 8. Find the area of this parallelogram.

3. The treasury of the Soviet Union has recently printed some rubles, and under the practice of communism, must distribute the rubles equally among all its citizens. Stalin notes that the rubles can be distributed such that every citizen receives 20 rubles and there are 25 left.

   As long as the population is at least one million, Stalin must execute at least P citizens so that all of the rubles can be distributed evenly among all of the Soviet people. Find the minimum possible P.

4. In rectangle $ABCD$, semicircles with diameters $\overline{AB}$ and $\overline{CD}$ meet at P and Q. If $PQ = 16$ and $AB = 20$, find the area of $ABCD$.

5. Find the sum of all bases $b \geq 6$ such that 20242025_b is divisible by $b + 2$.

6. Rectangle $ABCD$ has $AB = 3$ and $BC = 5$. Points E and F lie on sides AD and BC, respectively, such that $AE = 1$ and the circumcircles of ABE and CDF are tangent to each other. The length of CF can be expressed in the form $\frac{a-b\sqrt{c}}{d}$, where $\gcd(a, b, d) = 1$ and c is not divisible by the square of any prime. Find $a + b + c + d$.

7. The number of positive divisors that n^2 has is thrice of that of n. Find the number of positive divisors of n^3.

8. 7

9. 8

10. 9

11. 10

12. 11

13. 12

14. 13

15. 14

16. 15
17. 16
18. 17
19. 18
20. 19
21. 20
22. 21
23. 22
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25. 24
26. 25