



Competitions Report

Twenty-one schools from around the state gathered at Middle Georgia State University's Robert Hatcher conference center for the 44th annual GCTM Mathematics Tournament.

Here, they tested their knowledge in all things mathematics, tackling problems in algebra, trigonometry, calculus, probability, number theory, and geometry. Students started the morning with a 90-minute individual written exam and then competed in individual ciphering. After a break, they competed with their team in a 30-minute round of competition. Teams earn their spots by qualifying at regional and local tournaments.¹

GCTM president, Kim Connely, presented awards to the top fifteen individual finishers, the top five schools, and the best school in each division from A to 7A and the best independent school.

The top five schools:

1. Fulton Science Academy
2. The Westminster School
3. Columbus High School
4. North Oconee High
5. Pace Academy

A special thanks to the people who contributed by writing questions and scoring; Dr. Charles Garner from Rockdale Magnet, Al Shorey from Darlington, Preston Earle from Stratford Academy, Angelique Allen from the Georgia Virtual School, Carolyn Yackel from Mercer University, Henry Oglesby from Woodstock High, and ARML coaches Debbie Poss and Don Slater.



North Oconee's Team



Tatnall Square Academy's Team

The combined individual ciphering and written tests are used to help ARML coaches Debbie Poss, Don Slater, and Charles Garner select students for

¹A list of upcoming tournaments can be found on GCTM's competition page at <https://www.gctm.org/competitions>

ARML (American Regional Mathematics League). ARML is a prestigious, national math tournament that is often called the “World Series of Mathematics Competitions.” Approximately thirty students from the GCTM math tournament qualified for this year’s team. This year’s ARML Competition is June 3-4, 2022. Teams from around the world will compete in person and virtually. For more information about the ARML competition visit <https://www.arml.com>



Sample Problem

This problem appeared on the written exam. The solution is on the last page.

Given $a > 0$ and $b > 0$, let $x = \log_2(a^3b)$ and $y = \log_4\left(\frac{b}{2a}\right)$. Find $\log_2(a)$.

- A $\frac{x - 2y}{4}$
- B $\frac{x - 2y - 1}{4}$
- C $\frac{2x - y - 1}{4}$
- D $\frac{x + 2y - 1}{4}$
- E $\frac{x - 2y + 1}{4}$

Solution

B

We can use the change of base formula to rewrite $y = \log_4 \left(\frac{b}{2a} \right)$ as $y = \frac{\log_2 \left(\frac{b}{2a} \right)}{\log_2(4)}$.

Multiplying both sides of the equation by $\log_2(4) = 2$ gives us $2y = \log_2 \left(\frac{b}{2a} \right)$.

$$2y = \log_2 \left(\frac{b}{2a} \right)$$

$$x - 2y = \log_2(a^3b) - \log_2 \left(\frac{b}{2a} \right)$$

$$x - 2y = \log_2 \left(a^3b \cdot \frac{2a}{b} \right)$$

$$x - 2y = \log_2(2a^4)$$

$$x - 2y = \log_2(2) + \log_2(a^4)$$

$$x - 2y - 1 = 4 \cdot \log_2(a)$$

$$\frac{x - 2y - 1}{4} = \log_2(a)$$