Contest Corner: The 2018 State Tournament of Mathematics Results

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Abstract: *In this article, the authors summarize results from the 2018 Ohio Mathematics Tournament. Included in the summary are sample tasks from the contest.*

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1 Introduction

It is widely accepted that mathematics competitions, like other academic competitions, spark student interest and encourage learners to value academic pursuits. Competition makes mathematics come alive for many students. The preparation for competition encourages teamwork, comradery, and friendship that are similar to that achieved in athletic activities. The Ohio Council of Teachers of Mathematics 45th annual State Tournament of Mathematics took place on February 24, 2018, with a total of 839 participating students representing 72 schools. The overall results for the top 25 schools are summarized in Table 1.

Table 1: *2018 Overall State Tournament Results*

Rank	School	Score	Rank	School	Score
1	Sycamore High School	154	14	Thomas Worthington High School	121
	William Mason High School	154	15	Aurora High School	111
3	Columbus Academy High School	152	16	Hathaway Brown High School	110
4	Dublin Coffman High School	137	17	Hilliard Darby High School	108
	Western Reserve Academy School	137		Upper Arlington High School	108
6	Dublin Jerome High School	136	19	St. Xavier High School	107
7	Avon Lake High School	133	20	Wellington School	106
	Hawken Upper School	133	21	Cincinnati Hills Christian Academy	105
9	Strongsville High School	130	22	University School	104
10	Seven Hills Upper School	129	23	Ashland High School	101
11	Copley High School	126	24	Rocky River High School	98
	Revere High School	126	25	Archbishop Hoban High School	97
13	Brecksville-Broadview Heights	122			

As has been done for many years, the OCTM also presented awards and recognition to participating schools by their size. In this way, small schools are not put in direct competition with larger schools. OCTM uses a five level system to group schools. Level 1 schools have fewer than 100 students per grade level, Level 2 schools have between 100 and 166 students per grade level, Level 3 schools

Table 2: *2018 State Tournament Results by Level (Levels 1-3)*

Level 1: $(n \leq 99)$	**Level 2:** $(99 < n \leq 166)$	**Level 3:** $(166 < n \leq 305)$
1. 152 Columbus	1. 133 Hawken Upper	1. 126 Copley
2. 137 Western Reserve	2. 110 Hathaway Brown	126 Revere
3. 129 Seven Hills Upper	3. 104 University	3. 111 Aurora
4. 106 Wellington	4. 96 Summit Country Day	4. 101 Ashland
5. 105 Cincinnati Hills Christian	5. 78 St. Francis De Sales	5. 98 Rocky River
6. 92 Miami Valley	6. 77 Perkins	6. 97 Archbishop Hoban
7. 82 Laurel	7. 75 Kirtland	7. 92 Carroll
8. 80 Lucas	8. 70 Edison	8. 90 Poland Seminary
9. 74 Worthington Christian	9. 67 St. Vincent-St. Mary	9. 83 Oakwood
10. 72 Ayersville	10. 57 Shelby	10. 78 Athens
11. 65 Granville Christian HS	11. 56 Black River	11. 77 Nordonia
12. 54 Trinity	12. 54 Jonathan Alder	12. 71 Dover
13. 52 Bluffton	13. 53 Alexander	13. 48 Madison
14. 33 West Union	14. 52 Highland	14. 37 Mount Notre Dame
		15. 31 Sylvania Southview

Table 3: *2018 State Tournament Results by Level (Levels 4-5)*

Level 4: $(305 < n \leq 422)$	**Level 5:** $(422 < n)$
1. 154 Sycamore	1. 154 William Mason
2. 136 Dublin Jerome	2. 137 Dublin Coffman
3. 133 Avon Lake	3. 130 Strongsville
4. 122 Brecksville-Broadview Heights	4. 108 Upper Arlington
5. 121 Thomas Worthington	5. 96 Lakota West
6. 108 Hilliard Darby	6. 86 Hilliard Bradley
7. 107 St. Xavier	7. 80 Glenoak
8. 92 Sylvania Northview	80 Walnut Hills
9. 84 Perry	9. 73 Beavercreek
10. 81 Perrysburg	73 Berea-Midpark
11. 71 Loveland	11. 60 Lorain
12. 69 North Olmstead	12. 58 Olentangy Orange
13. 46 Marysville	13. 45 McKinley
14. 16 Twinsburg	14. 42 Hilliard Davidson

have between 167 and 305 students per grade level, Level 4 schools have between 306 and 422 students per grade level and Level 5 schools have more than 422 students per grade level. Tables 2 and 3 show the 2018 tournament results by level. A tally summary describing the frequency of scores for all student participants is provided in Table 4.

Table 4: *Frequency of scores*

score	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
n	1	2	7	6	11	16	24	34	33	38	34	61	44	46	42	36	40	36	21	37	21
score	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	
n	23	24	18	20	20	14	15	14	9	15	10	7	10	10	10	3	8	6	9	4	

2 Sample Contest Items

Seven problems selected from the 40 that appeared on the 2018 tournament are shown in Figure 1. All of the problems can be solved using principles of algebra, geometry, and arithmetic intermixed with strong problem solving skills. Calculators are always allowed on the OCTM tournament. Visit

the contest website (`www.octmtournament.org`) for copies of previous contests as well as answers. Problems from these contests can be used with mathematics clubs or in math class to prepare mathletes for future competition.

	ANSWERS
1. What is the slope of the line $\frac{x}{20} - \frac{y}{18} = 2018$? A. $-\frac{20}{18}$ B. $\frac{20}{18}$ C. $-\frac{18}{20}$ D. $\frac{18}{20}$	D
2. Find the value of b – 18a, if f(2) = f(18) and $f(x) = \begin{cases} ax-18 & \text{if } x<19 \\ 20x+b & \text{if } x>19 \end{cases}$	-418
3. Two vertices of a square are (20,18) and (20,-18). Find the ***smallest*** possible area enclosed by the square.	100 sq units
4. Find the ***least integer*** value of k such that the equation $20x^2 + kx + 18 = 0$ has no real solutions.	-37
5. Express in simplest form: $\frac{n!(n+1)}{(n-1)!} \bullet \frac{1}{n^2+n}$.	1
6. I. M. Rich invested $10,000 at simple interest for one year, part at 6% and the rest at 5%. If the total amount of interest earned after one year was $520.09, how much money was invested at 5%?	$7991
7. The average of 20 numbers in a set is 14. The average of 14 of these numbers is 20. What is the average of the other 6 numbers in the set?	0

Fig. 1: *Sample contest problems.*

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