Contest Corner

A New 20 Minute Mathematics Contest: Practice For Competition

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Introduction

The OCTM's 2012 State Tournament of Mathematics took place on February 25, 2012. Now is the time to start assembling a team to represent your school in the 2013 competition! Since the 2012 results were not available as we go to press with this article, we can revisit the 2011 contest results. You can find more information on the OCTM State Tournament of Mathematics at http://www.octmtournament.org. Overall results from the 2011 State Tournament of Mathematics are summarized in table 1.

Table 1 2011 Overall State Tournament of Mathematics Results

Rank	School	Score
1	Dublin Jerome High School	133
2	Sycamore High School	130
	William Mason High School	129
4	Copley High School	124
5	Revere High School	120
	Solon High School	117
7	Upper Arlington High School	117
	Brecksville-Broadview Heights	116
9	Hawken Upper School	115
10	Olmsted Falls High School	115
	Western Reserve Academy School	113
	Walnut Hills High School	111
13	Westlake High School	110
14	Seven Hills Upper School	109
15	St Xavier High School	109
	Athens High School	108
	Columbus Academy High School	108
18	Dublin Scioto High School	102
	Hudson High School	102
20	Lakota West High School	101
21	Dublin Coffman High School	100
22	Miami Valley High School	99

Contest Groupings

The OCTM also presents 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 162 students per grade level, Level 3 schools have between 162 and 234 students per grade level, Level 4 schools have between 234 and 362 students per grade level and Level 5 schools have more than 362 students per

grade level. In April, every school Principal in Ohio is mailed a copy of the tournament score report. Be sure to ask your principal for a copy of the 2012 results.

Tournament Preparation

Some contests that can be administered in your school as preparation for the OCTM State Tournament of Mathematics include:

- **Ohio Mathematics League www.themathleague.com**
  Sample contest at: www.themathleague.com/ml-files/hs_contest_1_2005-06.pdf

- **American Scholastic Mathematics Association www.asan.com**
  Sample contests at: phsmathletes.wikispaces.com/ASMC

- **Atlantic-Pacific mathematics League www.atpacmath.com/**
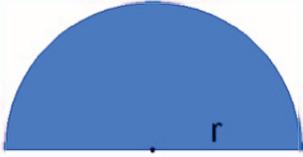 Sample contest at: www.atpacmath.com/forms/samphs.pdf

These mathematics leagues are great experiences for students that will help prepare them for the OCTM's State Tournament of Mathematics.

Tournament Questions

Most of the annual State Tournament of Mathematics questions consist of routine problems found in standard high school mathematics textbooks. All of the problems can be solved using algebra, geometry, and arithmetic. Furthermore, calculators are certainly allowed. Preparation for this annual contest can be accomplished in a variety of ways. However, many successful schools have mathematics clubs that regularly take short contests for preparation. The following is a 20 minute mathematics contest that can be used in the classroom or with a mathematics club. It is setup in the format of the mathematics leagues mentioned above.

PRACTICE MATHEMATICS CONTEST*

NAME_____ SCORE_____

TIME LIMIT: 20 minutes

	ANSWERS
1. If i represents $\sqrt{-1}$, simplify $(1 + i)^{12}$.	
2. The perimeter of a semicircular region, measured in centimeters, is numerically equal to its area, measured in square centimeters. Find the radius of the semicircle in centimeters.	
3. A shepherd wants to divide his flock among his 4 sons so that his oldest son gets one-half the flock, his next oldest gets one-fourth, his third son gets one-fifth, and his youngest son gets 7 sheep. How many sheep are in the shepherd's flock?	
4. Find the shortest distance from the point (4,5) to the line $4x - 3y = -1$.	

Solutions to these problems require only the application of some basic high school mathematics. It should be noted that there are many ways to solve each of these problems. One possible solution to each is presented.

PRACTICE MATHEMATICS CONTEST SOLUTIONS	ANSWERS
1. $(1 + i)^2 = 2i$ Therefore, $(1 + i)^{12} = (2i)^6 = 2^6 i^6 = 128$	128
2. The circumference of the figure is $C = \pi r + 2r$ and the area of the semicircle is $\frac{\pi r^2}{2}$. Therefore, $\pi r + 2r = \frac{\pi r^2}{2}$. Solving for r gives $2 + \frac{4}{\pi}$.	$2 + \frac{4}{\pi}$
3. If x is the number of sheep in the shepherd's flock, then $\frac{1}{2}x + \frac{1}{4}x + \frac{1}{5}x + 7 = x$ and $x = 140$	140
4. The formula for the shortest distance from a point to a line (it is very instructive to derive this formula for your students) is: $d = \frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}}$ where $Ax + By + C = 0$ is the line and (x_1, y_1) is a point off the line. Using this formula yields: $d = \frac{|4(4) - 3(5) + 1|}{\sqrt{16 + 9}} = \frac{2}{5}$.	$\frac{2}{5}$

* For similar problems see The Contest Problem Books published by the Mathematical Association of America (www.maa.org).

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